MARINE REVIEW

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SUMMARY OF GREAT LAKES SHIP BUILDING.

The following answer made by the Marine Review to an inquiry from New York regarding the amount of ship building now under way on the great lakes is interesting as a brief summary of contracts at all the ship yards: "Lake ship builders are now working on orders involving the completion before June next of thirty steel steam vessels and four steel tow barges, the aggregate capacity of which on 18 ft. draught will be 136,300 gross tons. All but two of the steam vessels are to be freighters. The exceptions are a car ferry and a steamer to be built at Collingwood, Ont., which is to carry both passengers and freight. The total of thirty-four ships includes four steam vessels and two barges, building for J. L. Crosthwaite of Buffalo and A. B. Wolvin of Duluth (managers), that are to go to the Atlantic coast, if possible, before the close of navigation this year. There are still six other vessels, all steamers, designed for Atlantic coast service, but they will not be finished until the early part of next season. All the new ships here referred to are of 3,000 to 7,000 gross tons capacity. No account is taken of small passenger steamers, tugs or similar small craft."

A Collingwood (Ont.) correspondent says: "Mr. Hugh Calderwood, superintendent of the Collingwood Ship Building Co., expects to give the Northwest Transportation Co. (Beatty line) a very fine steel freight and passenger vessel. Everything is in readiness to go ahead with the work of construction. The steamer is to be built under survey of the Great Lakes Register, and is to have the highest class, star and crescent 100, in that register. Accommodations are to be provided for 250 passengers and the design of hull will be such as to admit of the carriage of both bulk and package freight. Dimensions are: Length over all, 325 ft.; between perpendiculars, 308 ft.; beam, molded, 43 ft.; depth, molded, 27 ft. The hull will be divided by five water-tight bulkheads. Five gangways on each side will be provided for freight and one on each side aft for passengers. Engines will probably be built by John Ingalls & Son of Toronto. They will be triple expansion and of about 2,200 H. P., givng the ship a speed of 15 to 16 miles an hour, loaded."

It is expected that the steamer Paraguay, one of the four Wolvin vessels designed for salt water service, will leave for the coast about Nov. 1, taking with her the two steel barges that are building at West Superior. The Paraguay will very probably be commanded by Capt. Norcross, who is looking after her fit-out. The other steamer, the Asuncion, is yet quite far from completion and may not go to the Atlantic until next spring. She will very probably be commanded by Capt. L. A. Rand, who is now in the steamer A. B. Wolvin.

The first of the steamers building for Capt. John Mitchell at the Globe yard, Cleveland, will be launched Nov. 3. She will be christened John J. Albright, after a leading coal and iron man of Buffalo.

Mr. Robert Wallace, brother of Gen. Mngr. James Wallace of the American Ship Building Co., is to have charge of the construction of the four steel vessels which the consolidation has assigned to the West Bay City yard. In addition to the considerable practical experience gained by being in close touch with his father and brother in all their affairs at Cleveland, Mr. Wallace has visited the leading ship building districts of the world at different times and has the advantage of college training at the Boston Institute of Technology.

OF SPECIAL INTEREST TO LAKE VESSEL MASTERS.

It would seem from accidents that have occurred during the past season in the vicinity of Gray's reef light-ship, Lake Michigan, that all deep-laden vessels in the Chicago trade are taking chances of serious injury unless they pass to the northward of the Beavers. One of the Minnesota line steamers found bottom in that locality not long ago and spent some time with her steel tow barge in dry dock, repair bills footing up about $30,000. On the 8th inst. another Cleveland steamer, going to Chicago with a cargo of iron ore, had just passed the gas buoy on a course midway between the buoy and the light-ship when she scraped bottom. The steamer was drawing 17 ft. 6 in. forward and 18 ft. 5 in. aft.

Dredges that have been at work all summer in the stretch of channel between Bois Blanc island and Amherstburg, just below the Lime-Kiln crossing, Detroit river, have completed to full 20 ft. depth a channel of 200 ft. width. This is, of course, a greater draught of water than is to be found at the Lime-Kiln crossing. The float lights marking the east bank of the channel have been moved to the eastward, so as to define the edge of the new cut, and vessels will now pass to the east of the dredges instead of the west. The range targets and lights on the Canadian shore, opposite the lower end of Bois Blanc island, will also be moved to the east, so as to mark the center line of the new channel. The east line of the channel will be marked by three floats with red lights at night, and the west line by three floats with white lights. The range on the Canadian shore will guide vessels through the middle of this channel, but on reaching the ends of lighted channel, vessels should gradually move into the line of travel heretofore followed above and below. This will leave the plant engaged in further improvements wholly to the westward of the channel to be followed.

Orders have been issued by the marine hospital service for the quick completion of the floating quarantine stations and disinfecting plants now in course of construction at the Kensington Engine Works, Philadelphia. The Defender, formerly the cryolite bark Ivigtut, will be towed to Porto Rico at once. The other two converted boats were the schooners Jennie Middleton and Georgie Clark. Each of the three vessels are to be equipped with disinfecting chambers. These will be supplemented by a sulphur furnace for fumigation by sulphur di-oxide and tanks and pumps for bichloride solution. This equipment will be placed on deck, so that while in operation in a hot climate it will not be necessary for any of the work to be done in the vessel's hold.

NAVAL ARCHITECTS AND MARINE ENGINEERS.

Secretary Francis T. Bowles of the Society of Naval Architects and Marine Engineers announces the completion of arrangements for the eighth annual meeting to be held in New York, beginning at 10 a. m., Nov. 15. This is an event of special importance to both the navy and merchant marine of the United States. Through the courtesy of the president and managers of the American Society of Mechanical Engineers, the meetings will again be held in the auditorium of No. 12 West Thirty-first street, the sessions continuing through the 16th. There will be a banquet at Delmonico's on Friday evening, Nov. 16, at which members and their guests are cordially invited. Following is a list of the papers to be read at the meeting:

THURSDAY, NOVEMBER 15, 1900.

1. Capacity Test of a Unique Form of Air Pump. By F. Meriam Wheeler, Esq., member.
2. Interchangeability of Units for Marine Work. By W. D. Forbes, Esq., member.
3. The United States Experimental Model Basin. By Naval Constructor D. W. Taylor, U. S. N., member.
4. The Composition and Classification of Paints and Varnishes. By Prof. A. H. Sabin.
5. Tests of the Electric Plants of the Battleships Kearsarge and Kentucky. By Naval Constructor J. J. Woodward, U. S. N., member.
6. Coaling of the U. S. S. Massachusetts at Sea. By Spencer Miller, Esq., associate.

FRIDAY, NOVEMBER 16, 1900.

7. Notes on Recent Improvements in Foreign Ship Building Plants. By Ass't Naval Constructor H. G. Gillmor, U. S. N., member.
8. Can the American Ship Builder under Present Conditions Compete with the British and German Ship Builders in the Production of the Largest Class of Ocean Passenger and Freight Steam Ships? By Geo. W. Dickie, Esq., member of council.
9. Classification Rules. By Theodore Lucas, Esq., member.
10. Recent Designs of Battleships and Cruisers for the U. S. Navy. By Chief Constructor Philip Hichborn, U. S. N., vice-president.
11. A Comparison of the Contract Prices of our Naval Vessels. By Harrison S. Taft, Esq., associate.
12. Launch of a Cruiser and a Battleship. By James Dickie, Esq., member.
13. The Safety of Torpedo-Boats at Sea and in action Under Various Conditions. By Naval Constructor Lloyd Bankson, U. S. N., member.

LAUNCH OF THE RETVIZAN.

The tremendous battleship Retvizan, built by the Cramps, Philadelphia, for the Russian navy, will be launched at the great Kensington ship yards on Tuesday next. The ceremony will take place somewhere near 1 o'clock, the exact minute being a problem, since it is impossible to determine the precise time of high water, and the slack of the current immediately before the ebb tide begins must be taken advantage of to launch a vessel like the Retvizan. Because the work of the yards will be in full swing during the launch, it has been decided that none except invited guests shall witness the event. The old system of admitting the public to the yards necessitated the stoppage of work for half a day; at this time the rush of work is too great to permit such a delay. Like the Variag, the Retvizan will receive her baptism without the breaking of the traditional wine bottle. Instead, the Russian ceremony, with its attendant peculiar religious rites will be used. To perform these rites, Rev. Alexander A. Hotovizky, rector of the Russian Orthodox Church, of New York, and his assistant, Rev. Elias I. Zotikoff, will be on hand. They will be assisted by Rev. Demetrius I. Gebey, of the Russian Orthodox Church of Philadelphia. The ceremony is extremely simple and impressive, the ship is blessed and her bow sprinkled with holy water by the clergy and sealed to her name with a naked sword in the hands of a Russian officer. The christening party will be made up of the members of the Russian embassy and the Russian officers now in Philadelphia inspecting the construction of ships and ordnance. The Retvizan is designed to be one of the most powerful armor clads afloat. She will be splendidly protected and will mount a terrific battery of both great and small guns. Her contract speed is 18 knots an hour, and she is so arranged that she can carry a supply of coal to give her wider cruising radius than any ship of her class.

The steamer Eureka of the Hawgood fleet will leave for the coast, Saturday, and the steamer Tampico of the same fleet will follow the Eureka next week. The Eureka is now on the way down from Lake Superior with ore, and as soon as she discharges her cargo she will start for the coast. Mr. Hawgood was figuring on loading her for Lake Ontario, but grain cargoes are scarce and the boats will probably both go light. Mr. Arthur Hawgood will go to New York to look after the vessels.

Work on the steamer Paraguay, which is building at the Lorain yard of the American Ship Building Co. for the International Transportation Co., is being rushed, and she will leave for the coast the week after next. The two Crosthwaite steamers, which were built for the lumber trade, and the steamer A. D. Thomson and two whaleback barges will get away during the next ten days, and that will probably be all the vessels that will start for the coast this fall.

It is said that the purchase of the large equipment of machine tools which the Wm. R. Trigg Co., ship builders of Richmond, Va., anticipate making will be deferred until after election. More than $150,000 worth of heavy tools are included in this lot.

TRIAL TRIP OF THE WISCONSIN.

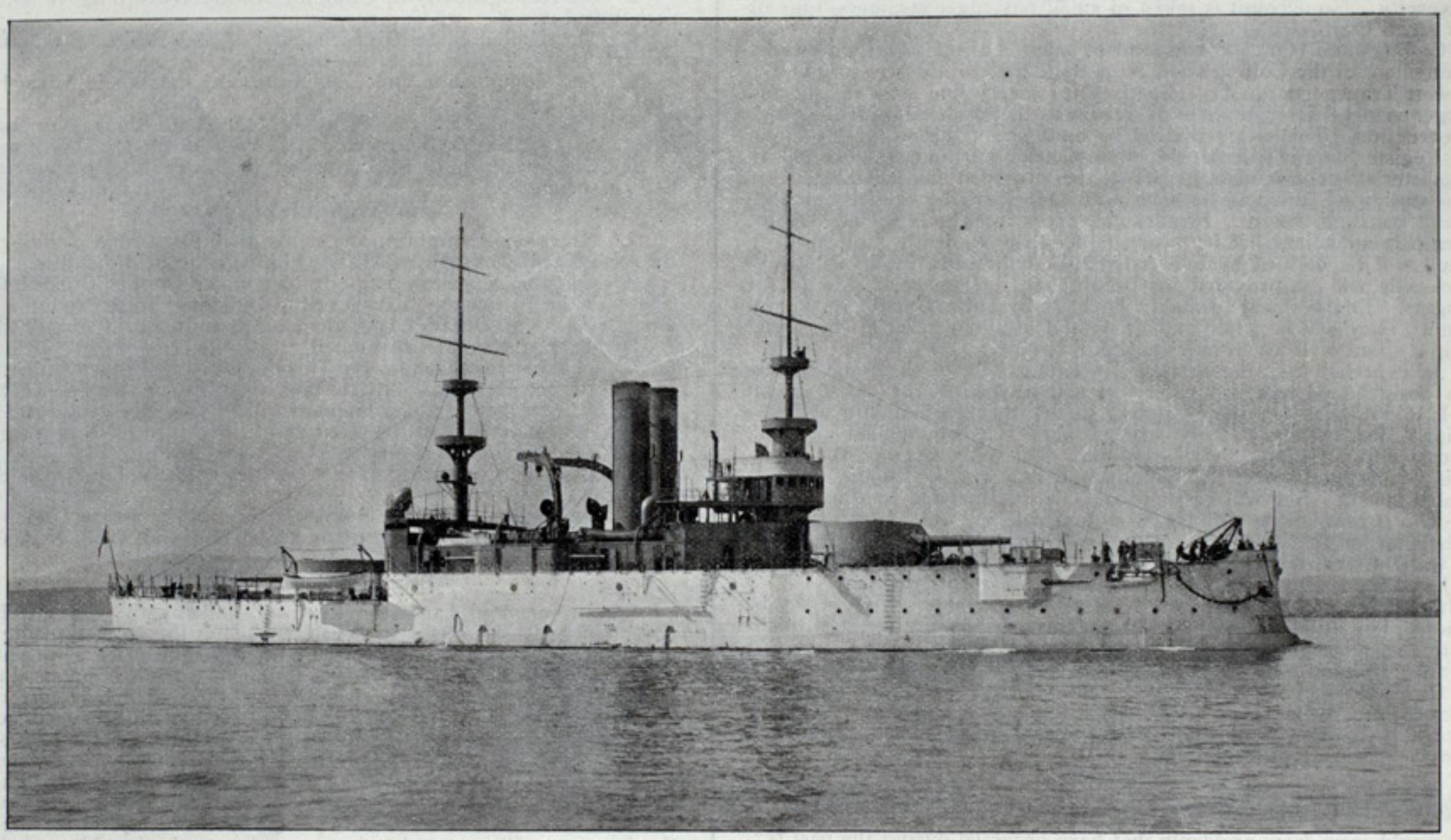
SHE IS THE FASTEST BATTLESHIP IN THE AMERICAN NAVY—DESCRIPTION OF THE VESSEL.

The battleship Wisconsin on her sixty-two mile run on Thursday last, on the government trial test, not only broke the record of her sistership Alabama but the record of every first-class battleship in the United States navy, and also established a record for seaworthiness that has never been surpassed. The fastest time made on a one-third spurt was at the rate of 18.54 knots an hour. The average speed for the four hours' run was 17.25 knots. This, too, under a southwest wind and the tide very unfavorable for speed. The course was thirty-two miles up Santa Barbara channel, off San Francisco, and return, four other warships acting as stakeboats. The inspection party, composed of Admiral Kautz, Capts. Cooper and Allen and Lt. Coms. Drake and McCracken, reserved their deductions for the navy department, but the opinion is unanimous that the Wisconsin is the fastest battleship in all weather that the American navy possesses. The engines were fed picked Cardiff coal in sacks, with every entrance to the engine room closed. Under the forced draft the mechanism worked perfectly, and at the close of the great effort the ship successfully swept through a series of elaborate evolutions to test her steering gear. Following upon the Oregon and the Monterey, which successively broke all records in their classes, the magnificent performance of the Wisconsin is the highest tribute to the Union Iron Works, and there was great rejoicing on board at the close of the run. Admiral Kautz expressed his gratification of the result, which established a new queen of the seas. The average speed for the four hours surpasses that of the Alabama, hitherto the fastest American battleship, by about one-quarter of a knot. The actual time in which she covered the sixty-two miles of the trial course was 3 hours, 56 minutes, 56 seconds, including the turn of the run back. With the time of the turn deducted and the allowance for tidal influences her actual speed was 17.25 knots.

The battleship Iowa was the stake boat at the starting point and took position at 9 o'clock. The Wisconsin steamed past her, turned, and then made her way back the distance of about four miles from the Iowa in readiness for the start. The measured course of thirty-two miles was marked by the Iowa, Ranger, Adams and Philadelphia, at intervals of eight miles, the Philadelphia marking the turning point. At 10 o'clock the Wisconsin was discerned plowing her way toward the starting point, carrying before her bow a wave of snowy water. But little smoke issued from her funnels, although they were already burned black under the intense heat of forced draft. It is expected that the tidal corrections, when completed, will indicate greater speed than recorded, as the current was against the vessel for a longer period than with her. By the terms of the contract the Wisconsin was required to steam at the rate of 16 knots an hour for four consecutive hours.

The Wisconsin is to carry a talisman which will distinguish her from her sisterships, the Illinois and Alabama. The state of Wisconsin, in recognition of the honor of such a namesake, is making her a bow plate, designed by Paul Kupper, the Milwaukee sculptor. A badger stands on top of a shield, upon which is written the state watchword "Forward." The shield is an adaption from the state coat-of-arms and bears in relief the plow and anchor which represent state commercial and agricultural activity. The figure is 4 ft. long and stands in full relief with the neck and head outstretched. The figure and shield are set against an oblong plate, which is ornamented in slight relief with a conventional scroll design. The whole is to be cast in bronze, 500 lbs. of which has been donated by the navy department and is of historical value. It is the last of that which was secured from the Spanish ships destroyed off Santiago.

Dimensions and other particulars of the Wisconsin are as follows: Length on load water line, 368 ft.; beam, extreme, 72 ft. 2½ in.; draught on normal displacement of 11,525 tons, 23 ft. 6 in.; maximum displacement, all ammunition and stores on board, 12,325 tons; maximum indicated horse power (estimated) 10,000; normal coal supply, 800 tons; coal supply, loose storage, 1,200 tons: full bunker capacity, 1,400 to 1,500 tons; complement of officers, forty; seamen, marines, etc., 449. The main battery consists of four 13-in. breech-loading rifles in Hichborn balanced turrets, oval in shape, and placed in the center line of the vessel, and fourteen 6-in. rapid-fire guns. The secondary battery consists of sixteen 6-pounder rapid-fire guns, four 1-pounder rapid-fire guns, two Colt guns, and two field guns. She carries four torpedo tubes. The 13-in. guns have an arc of fire of 135° on each side of the center line; and the 6-in. an arc of 90° on the broadside, with the advantage of those on the upper deck of a direct fire ahead and astern. Any injury to, or near, either of these 6-in. guns will be confined to its own compartment, as a 1½-in. steel splinter bulkhead separates each of these guns from its neighbor. The armor belt, which extends from the stem to abaft the after turret, is 16½ in. thick at the top, and 9½ in. thick at the bottom, except at the forward end, where it tapers to 4 in. at the stem. This belt armor extends from 4 ft. below the normal load line to 3½ ft. above it, and maintains the full thickness amidships between the turrets, and for the distance occupied by the engines and boilers. Diagonal armor 12 in. thick, connecting this belt armor and barbettes, and extending from the slopes of protective deck to top of the side belt, on each side, is worked to give protection from a raking fire. Abaft the after turret the protection will be completed by thickening the protective deck to 4 in. on the slopes, with 2¾ in. on the flat. On the slopes of this deck forward it is 3 in. thick and 2¾ in. on the flat. The armor on the 13-in. gun turrets is 17 in. on the front and 15 in. on the rear and sides, while on the barbettes for these turrets, which are circular in shape, it is 15 in. on the front and 10 in. on the rear and sides. The sides of the vessel above the belt armor in wake of the 6-in. battery, and forming the casemate, are armored with 5½ in. of steel, extending between the turrets with diagonal armor of same thickness at the ends, connecting with the barbettes, and worked above the 12-in. diagonal armor below.



THE BATTLESHIP WISCONSIN, BUILT BY UNION IRON WORKS, SAN FRANCISCO.

The ship is protected against the entrance of water, in case of injury to the side, at the water line, by cofferdams extending for the length of the vessel on each side, and having a general width of 3 ft., with a total capacity of about 12,500 cubic ft., for stowage of fire-proofed corn-pith cellulose. Independent of the numerous small water-tight pockets or cells forming the entire scheme of cofferdams, the inner bottom and hold, the platforms, splinter and berth decks, are divided into between 200 and 300 water-tight compartments, both for the accommodation of the motive power and the stowage of coal, provisions, ammunition, and other stores, and also for the preservation of the ship in the event of rupture of the outer skin, or injury in battle. All these many compartments are provided with pipes connecting with powerful steam pumps, for the purpose of removing any water that may get in them either from accident or design. Arrangements are also made for flooding all ammunition rooms in the event of fire on board the vessel. All these compartments, together with all living spaces, staterooms, etc., occupied by the officers or crew, have special pipes or ducts arranged with a view of supplying fresh air to the occupants, and to make the temperature of all store rooms, even in the most remote parts of the vessel, comfortable and healthy. These pipes all connect with powerful blowers, which draw fresh air by means of ventilators extending from 10 to 20 ft. above the ship's deck.

The forward conning tower armor is in thickness 10 in., oval in shape, size in the clear 7 by 11 ft., with an armored tube 7 in. thick extending down to the protective deck, to house all wires or other means of interior com-

munication, so that the officer conning the vessel in action can be in constant and safe communication with all parts of the vessel. An after conning or signal tower is also provided, having an inside diameter of 6 ft. and a thickness of 6 in. The turrets are operated by electric power; also the ammunition hoists, and the dynamo and auxiliary blowers for ventilating purposes.

There are some eighty odd auxiliary engines in the vessel, thus adding greatly to the efficiency of the ship, in the celerity and certainty with which the work can be done. The cranes for handling the boats are operated by steam; also the deck winches, pumps, windlass and steering gear (this latter is located beneath the protective deck, and several feet below the water line). The introduction of these auxiliary engines is brought about mainly by the variety and nature of the work to be done, and the demand for the latest and best in every branch of mechanics represented in a man-of-war. Manual labor is therefore reduced to a minimum, a condition of affairs which must result in a greater interest and development of the crew in their special duties, as now required in a modern battleship, where fighting, and all that leads up to thorough efficiency in that line of art, is not handicapped by the constant drudgery so universal in the old-time vessels of our navy.

The height of freeboard forward of the vessel's hull proper, is 20 ft., and at the stern, 13¼ ft. The floor of the pilot house is 44 ft. high, thus placing the eye of the steersman, for ordinary cruising, about 50 ft. above the water. The sight holes in the armored conning tower for use in close fighting are 34½ ft. above the water. The bore of the forward 13-in. guns will have an elevation of 26½ ft., and the after 13-in., 19 ft., above the surface of the water. The 6-in. guns vary from 15 to 22½ ft., and the 6-pounders from 30 to 40½ ft. above water, according to their location on the vessel. The smaller guns are mounted in the military tops, at heights of from 59 to 79 ft. This great height above water of both main and secondary batteries will enable the vessel to be fought in any weather; a quality always sought for, but obtainable only in vessels of good size, and considered of immense advantage by all naval authorities. She is also provided with bilge keels, placed before and abaft the midship body only, so as not to interfere with docking her. These keels have a maximum depth of 3 ft., and will largely tend to lessen her motion in a seaway, and so contribute to her steadiness as a gun platform, so essential for correct gun fire. Four powerful electric search-lights are also provided, two on top of the forward chart house, and two on each side of the after military mast, all having an elevation of 25 ft. above the water, and commanding a complete all-round range.

The vessel is equipped with two sets of triple-expansion, twin-screw engines, each in its own separate water-tight compartment; the collective indicated horse power will be about 10,000, with 120 revolutions per minute; stroke, 4 ft. There are eight single-ended cylindrical boilers, each 15½ ft. in diameter by 9 ft. 11¼ in. long, having a total grate surface of 685 sq. ft., with 21,200 sq. ft. of heating surface; pressure, 180 lbs. These boilers are placed, two each, in four separate water-tight compartments. The smoke pipes are two in number, and stand abreast of each other.

FLETCHER'S NEW STEAM YACHT ALVINA.

One of the finest steam yachts in the country is being built at the yard of the Harlan & Hollingsworth Co., Wilmington, Del., for Charles Fletcher, the millionaire woolen manufacturer. Mr. Fletcher's new yacht is to be named Alvina, and she will be a veritable floating palace in modern appointments, as may be noted from a perusal of some of the principal plans here given. The Alvina will cost about $250,000. She is a steel twin-screw steam yacht with the following dimensions: 215 ft. over all, 178 ft. waterline, 26 ft. 8 in. beam, 11 ft. 6 in. draught. She is to be rated 100 A1 at Lloyd's. In the hull there are seven water-tight bulkheads and two laid decks. At the forward end above the main deck will be a forecastle deck, under which will be arranged the windlass, crew's mess, firemen and oilers' quarters; also a large galley for officers and crew. There is a long continuous deck house extending from just abaft the foremast to just abaft the mainmast. In the forward end of this house is the dining room, aft of which is a hallway on the starboard side, connected with a covered passageway leading aft. The pantry and galley of the owner are situated on the port side of the deck house, boiler inclosure, a large laundry and engine room casing, then a library, large stateroom and hallway complete the whole deck house accommodations. On top of the main deck house and just forward of the smokestack is a structure in which is arranged the captain's room and a chart room. The yacht will be steered from a flying bridge above this structure, pipe rails surrounding the space. The Alvina will be schooner rigged and will carry three boats on a side, one on the starboard side well aft to be a steam or naphtha launch. Going below through finely fitted companionways, the visitor will find the accommodations very roomy. Beginning forward under the decks are located the sailors' quarters, then the officers' quarters and next aft three large staterooms, besides owner's bath room, coal bunkers and machinery space. Further aft there are to be five staterooms of good size, three being very large, also two bath rooms and a large cabin.

The yacht's finish will be most elaborate throughout, and she will be built strongly and with great care. Arrangements have been made for water ballast, and for this provision she will be fitted with two large tanks, one to be forward of the machinery space and the other to be aft of it. The yacht will be driven by two sets of triple expansion engines, together developing 1,300 H.P., natural draft. Steam will be furnished by two Scotch boilers, and there will also be a donkey boiler. Auxiliary machinery, consisting of air and feed pumps, two electric light plants, evaporator, distiller and ice making machinery, will be installed, each to be the best of its kind. There will be a bunker capacity of 170 tons of coal. The contract speed of the Alvina is to be 14 nautical miles an hour for a 4 hours' run. She is intended for long voyages, and will probably be taken to Europe next summer. She will have a waist of good depth, with bulwark rails constructed from just abaft the foremast to the stern. A brass rail will be placed on the sides forward of the foremast. The bow and stern will have characteristics of the big steam yacht Corsair. The Alvina was designed by A. S. Chesebrough of Bristol, who superintends her construction. Mr. Fletcher holds membership in the New York and Bristol yacht clubs.

REPORT ON THE NAVAL MANEUVERS.

The navy department has received Admiral Farquhar's report on the recent maneuvers of the North Atlantic squadron off Newport. The admiral comments primarily on the zeal and enthusiasm which the mimic naval warfare awakened among the officers and men. The exercises proper began Sept. 24, when the red squadron, consisting of the Kearsarge, Indiana, Texas, Scorpion and Eagle, accompanied by six torpedo boats, put to sea to establish a blockade of Newport. The remaining vessels—the New York, Massachusetts, Leyden and Vicksburg—were stationed as defenders of the harbor, and constituted the blue squadron. Admiral Farquhar says:

"The general plan followed by the blue (inside) squadron was to place a battleship on each side of, and just inside, the mouth of the harbor, concealed from incoming vessels, with steam up, battery trained forward, and everything ready to fire into and ram any vessel succeeding in passing the forts. One battleship, the Vicksburg, was placed just to the southward of Gould island. Picket boats, armed with rapid-fire guns and sharpshooters, were placed on both sides of her, 400 yards apart. All picket boats were provided with a system of signals to warn all hands of the approach of the enemy. The New York was placed well inside, commanding the full length of the main channel, and in a position to go to any part of the field. Picket boats were placed on each side of the eastern passage, out of the rays of the searchlights, prepared to destroy or cripple torpedo boats, and to report their approach. A lookout signal station was also placed at Beaver Tail light-house. The eastern passage was kept lighted by searchlights from the torpedo station, Fort Adams and Fort Wetherell. The western passage was lighted by a powerful searchlight at Fort Greble. The ships were cleared for action, batteries prepared and manned, and every condition of battle simulated as nearly as possible, though firing only blank charges from small rapid-fire guns.

"While so much was wanting, both in time and material, to carry out maneuvers on a large scale, there was no lack of zeal and enthusiasm among the men and officers engaged, and a number of very important professional points were brought out that will no doubt be of great value in the future. The army officers were particularly impressed with the value of searchlights, and they had an opportunity of seeing something of their effect when used on board vessels passing forts. The general plan followed by all vessels was not to turn on searchlights until the approach of a torpedo boat was reported by a picket boat.

"The plan of placing picket boats was very successful; not a single torpedo boat got by them without being reported. With a sufficient number of searchlights on shore it is doubtful if vessels could be piloted into a harbor at night that was at all difficult of entrance. The bow wave and wake of torpedo boats was the first object that aided in picking them up in the darkness. In this connection I would suggest the advisability of the department's keeping as many torpedo boats or destroyers as practicable with the squadron at all times to accustom both officers and men with their general characteristics, movements, etc., and in order to carry on exercises with them in all the various ports visited. The Holland unfortunately in her attack upon the Kearsarge the second night did not reach there until after several torpedo boats did. The second night's operations consisted in an attack upon the outside or red squadron by five torpedo boats and the Holland. As a rule, the torpedo boats were successful, although this would scarcely have been the case with an efficient picket boat service."

In an accompanying report Capt. Folger says: "The Holland type will play a very serious part in future naval warfare."

REPAIRING LA LORRAINE AT SEA.

The French steamship La Lorraine, biggest and swiftest of Gallic merchantmen, arrived at her pier in New York Sunday last after a tumultuous passage from Havre, on which her engineers distinguished themselves by as clever a bit of repairing as ever was done on a liner in a seaway. The Lorraine ran into heavy weather the first day out and shipped a big comber that smashed the port hawse pipe and carried away the anchor dangling from the port bow. At 9 o'clock on Monday night Chief Engineer Jean Vallin, who was in his room, observed that there was a change in the song of the port engines. He knew that something was out of gear. Second Engineer Gerby, who was standing on the steel stairway just abaft the low-pressure cylinder, noted the difference in the vibration as soon as his superior and ran up to the chief's room and told him that something seemed to be the matter with the connecting rod of the low pressure engine. Before leaving his post Gerby had slowed down the port engines. The chief ordered them stopped and immediately made an investigation. He found that the upper part of the connecting rod was cracked. If the engineers had not discovered the accident, there might have been mischief in the ship after the connecting rod broke. Chief Engineer Vallin called Capt. Poirot into consultation and the captain informed Eugene de Bocande, agent of the French line at New York, who was a passenger. The engineer surmised that he would be able to make the port engines just as good as new by taking out the broken connecting rod and substituting a spare rod from the hold. The duplicate rod weighs about 5,000 lbs., and the alert mechanics of the Frenchman had a hard time bringing it into place while the steamship was rolling in heavy seas, the crests of which frequently came aboard. The ship was also pitching somewhat and the workmen had to hold on at times by their eyebrows and their toenails, metaphorically speaking. But the liner was not slowed down a bit on her starboard engines. They sent her along at three-quarters speed and she anchored off the Bar at 2 o'clock Sunday morning. The engineers had the old shaft out and the new shaft in after laboring hard and carefully for fifty-four hours. Then the Frenchman proceeded at full speed. She made on the nautical day ending at noon on Thursday 500 knots, which is more than any French passenger carrier had ever reeled off before. She is capable of doing much better than this in pleasant weather. Her commander believes that eventually, when she "finds herself," she will do what was expected of her by her builders—that is, average about 22 knots on a voyage across sea.

John A. Andrews of Newton, Mass., W. J. Wilson of Cambridge, Mass., J. Whitney Beals, Jr., and James W. Longstreet of Boston have incorporated the Dominion Dry Dock & Ship Building Co., with main offices in Dartmouth, N. S.

TRADE IN CHINA.

RUSSIAN COMPETITION A SOURCE OF ALARM TO GREAT BRITAIN—SIBERIAN RAILWAY WILL DEVELOP RUSSIAN INTERESTS.

From Engineering, London.

While it is necessary to study the conditions of British trade in China, and to note the causes which affect its development, it is also desirable that we should keep ourselves acquainted with the circumstances connected with that of our competitors, for it is only by so doing that we can really understand the various problems which arise in connection with our own. Russia is generally considered our chief political opponent in the Far East, although there does not seem to be much to justify such opposition, as the resources and influence of Britain and Russia seem to be supplementary to each other. No doubt as the trade and industry of Siberia and Manchuria develop, competition will arise, but there are no reasons why it should not be of a friendly nature. At the present time such competition cannot be said to exist. Russia is one of China's largest customers, receiving a tenth of her total exports, and more than half her tea, but the whole of Russian trade is certain to be very much developed, and no doubt changed in character when the Siberian railway is in working order. A study of the doings of Russia in the north of Asia shows that that railway is only part of a policy which was settled long ago, and which has been followed with a dogged persistence, as all Russian plans are. During the past quarter of a century, however, the change which has taken place in social and economic conditions in Russia has caused greater attention to be given to the development of Siberia, in order that room may be found for the rapidly increasing surplus population of Russia, and that markets may be created for the manufactured products which are now being turned out from the rapidly increasing industrial establishments which are to be found in many parts of the country.

The progress of Russia across Siberia arose from the necessity of having an opening for her trade on the Pacific coast, and when the Trans-Siberian railway was commenced Vladivostock was looked upon as its natural terminus. The disadvantages of that port, however, were urged as an excuse for the demand for one further south, and on the termination of the war between Japan and China her representatives soon made it plain that they wanted a position which was not only more convenient for trade, but also stronger from a military and naval point of view. By means of a diplomacy, which cannot be defended, they obtained possession of Port Arthur and Talien-wan, the former of which dominated the Gulf of Pe-chili and the way to Peking, while the latter supplemented it as a port for commerce. The possession of Wei-hai-Wei by the British was a very small compensation for the increase of Russian influence; in fact, it is doubted whether our strength in China is at all increased by this port, which is not fortified, and not to be compared from any point of view to Port Arthur, on which for a long time the Chinese had lavished large sums of money in building fortifications, and which has since been greatly strengthened by the Russians.

Moreover, Vladivostock is no longer the ice-closed port in winter it formerly was, for the resources of modern ship building have been called in, and powerful ice-breakers keep it open the whole year round, so that there is now no interruption of traffic at any season, and passenger steamers come at regular intervals all the winter, so that the reason for obtaining possession of Port Arthur no longer exists. Still, the climate is not good in winter, and naturally the officers of the men-of-war prefer to winter in Port Arthur or Nagasaki, although in summer time the bright side of life in Vladivostock is quite as attractive as in the southern ports. The place has been strongly fortified, but strangers are strictly prevented from visiting the fortifications, which are to be seen on all the hill-tops. Magazines, masked batteries, and other means of offence and defense have been provided, and they are connected by an electric tramway and by telephone and telegraph, so that in case of attack communication with the various points can be rapidly established. The number of soldiers stationed at Vladivostock has been greatly increased, and probably it would be a more difficult place to capture than Port Arthur, about which we have heard so much recently.

The trade of Vladivostock is considerable, the most of the larger establishments being kept by Russians and Germans, although there is one prosperous American house, with branches at Port Arthur, Newchwang, and a few other Manchurian cities, ready to take advantage of the new trade conditions which will come with the building of railways in Manchuria. Vladivostock is, however, a cosmopolitan city, with large colonies of Chinese, Japanese and Koreans, who have their own shops and live in their own way. There are two lines of steamers between Nagasaki and Vladivostock. One is that of the Russian volunteer fleet, and as they call at no intermediate ports they do the voyage in three days. The other is the Nippon Yusen Kaisha (Japan Steamship Co.) which performs a more frequent service, and calls at Gensen and Fusan on the Korean coast, and the vessels take six days for the voyage.

The completion of the Trans-Siberian railway, with its Manchurian section, will before long virtually abolish the ancient caravan trade. Since the Russians became masters of Turkestan, the green tea which was formerly supplied by Parsee and Persian merchants in Bombay, who bought it for export on the Yang-tse-Kiang and shipped it to Karachi, and sent it northward by way of Peshawar, Cabul and Herat, into Bokhara and Samarkand, is now sent by the Russian volunteer fleet to Batoum, on the Black sea, and thence by an easy journey along the Trans-Caucasian and Trans-Caspian railways to the very heart of the green-tea-drinking populations. Thus the Bombay merchants have lost almost all this business, and the tea shipments to India fell 75 per cent. between 1896 and 1897 from 6,183,000 lbs. to 1,513,620 lbs. The most important caravan route is via Urga to Kiahta and Irkutch. Other routes, but of less value, connect Western China with the Semipalatinsk region. The general export from Siberia by these roads does not exceed 2,000,000 to 3,000,000 roubles, and is annually decreasing. The import is almost exclusive tea, which in 1898 reached 1,598,000 poods (57,500,000 lbs.), of a value of 16,292,000 roubles (£1,720,000). Excluding tea, the export and import trade of Siberia with China have been about equal in value. Beyond tea forming 98 per cent., the other articles of import from China to Siberia have been cotton and silk goods and sugar. The possibilities of the future, however, are great. Russia, on her side, can supply China with cotton and woolen fabrics, meat, leather and hides, manufactured goods in general, and minerals. The rich Ural district, and even Siberia itself, in a more eastern direction, could export the latter. The agreement with China, with the construction of the railway through Chinese territory, lays all the fertile fields of Manchuria, and in general the resources of China and Korea, at Russia's disposition. The following figures, showing the exports from China and the imports into China of Russia and Great Britain in 1899, give the present relative position of these two countries:

	Exports from China.	Imports into China.
Russia	£2,461,565	£ 513,367
Great Britain	1,941,784	6,602,338

and prove that there is room for co-operation in commerce and industry, and that Britain, with her excess of imports into China, might help Russia with her excess of exports.

The imports to Siberia, hitherto mostly via the Far East, are thus distributed: From Russia, cheap manufactured articles, tobacco, spirits, sugar, leather, iron goods, paper, fabrics, etc. From the United Kingdom are sent cotton and woolen fabrics, iron, tin, machinery, etc. Germany, thanks to activity of German firms in the Far Eastern ports, has a predominating influence on the import trade of Siberia, her wares in general being of the most varied kind, if but of moderate quality, including manufactured articles, furniture, sugar, wines, household crockery, etc. From France there is imported fashionable apparel, preserves, wines, etc. From Japan mostly wheat, rice, salt, and fruits. From China, as we have seen, the trade is practically in tea alone. The latest obtainable statistics show that Germany had about 30 per cent. of this trade, and the United Kingdom 25 per cent. It is mostly via Vladivostock, Nikolaevsk, Blayovestchensk and Yan. The exports from Siberia, via the west, are, first of all, grain, then meat, hides, butter, wool, game, eggs, etc. The imports by western rails are iron and iron goods, machinery of all kinds, sugar, spirits, wines, petroleum, manufactured articles, etc. The development of Manchuria must lead to a great demand for machinery and appliances of all kinds, and the Russian government is anxious to encourage their importation. From the beginning of next year practically all the most important articles used in the various industries are to be exempted from customs duties.

From a report by Mr. Paul Dmitrevsky, Russian consul-general at Shanghai, we learn a good deal about the competition to British shipping in the Far East, and especially of the effects of Russian merchants to organize the river-traffic, and the attempt of a combination of Russian tea merchants to establish a river-boat company of their own. The plan, however, fell through, owing to the sloth and mutual jealousy of the Russian merchants, and the carrying trade remained in British hands. Nowadays freights rule fairly low, thanks to the increase of the British mercantile marine in Chinese waters and the competition of Germans, Norwegians and Japanese, but M. Dmitrevsky thinks that in the past the Russian merchants have suffered dreadful things at the hands of the British navigators, and he believes that the British carrying trade in Chinese waters is doomed to decay, as we cannot compete with subsidized German shipping associations, and with the vigorous growth of the young Japanese mercantile marine. We need not allow such an opinion to affect our spirits to any great extent; we must carefully note the conditions under which the trade is being carried on, and observe all the factors which affect it. The importance of the Russian element is certain to increase at a very rapid rate, and, meantime, we have done little beyond directing attention to it.

NEW SYSTEM OF FOG SIGNALLING.

The United States light-house board is making experiments with a new system of fog signalling at Falkner's island, in the sound, near the Thimble islands, beyond New Haven. The principle of the new invention was tested last year and found correct, so this year the complete apparatus has been put up. It consists of eight megaphones, 10 ft. long, each directed to a different point of the compass. The small ends of these eight megaphones meet in a ring, inside which is a revolving cowl, which turns on the top of a siren. This siren is kept constantly spinning at the rate of 2000 revolutions a minute, and when compressed air is admitted to it it gives forth a very penetrating and far-reaching sound, the tone of which is about C in the middle octave.

Compressed air is supplied to a large reservoir by an oil engine, which runs at a high speed. From this reservoir the air is taken to the siren through an oddly-constructed valve, by means of which a current of air at a pressure of 200 lbs., passing through a 2-in. pipe, can be controlled by a touch of the finger. This valve is operated by a series of teeth on a signal wheel, which revolves slowly, producing different signals as each of the different megaphones comes into range of the revolving cowl. These signals consist of long and short blasts, the long ones being three seconds each and the short ones one second each.

The eight points of the compass are distinguished by the difference in these signals. Opposite points have exactly opposite signals, that for north, for instance, being one long blast, and for south one short blast. For east it is one long and one short, and for west one short and one long. For southeast it is one long and two short, and northwest two short and one long. For southwest it is two short and for northeast two long. These signals announce to the mariner the direction from which the sound comes, so that if a vessel was passing Falkner's island and heard two short blasts it would know that Falkner's island must be southwest of it. It could not hear any other signal but the one pointed toward it, because the megaphone sent the other sounds in a different direction; but if the vessel were to keep on its course until Falkner's bore due west, it would then be unable to hear any signal but the short and long blast which signifies west.

These signals were suggested by Col. D. P. Heap, engineer of the third light-house district, at Tompkinsville. The apparatus is so constructed that it is self-locking, and cannot be made to blow any but the right signal through any megaphone. No matter what happens to the machine or the engine, it will make no sound at all, or it will make the right one. It is not intended to use this apparatus in fogs at present, as it would be confusing to mariners who are not aware of its existence, and the light-house board always gives ample notice of any changes in its warning signals.

OLD USAGES AND CUSTOMS IN NAVAL SERVICE.

Modern naval architecture and the adoption of new methods for the regulation of ships and men have not obliterated old usages and customs in the British navy, and according to the opinion of a writer in the London Mail, "There will be a big shaking up of dry bones in our navy when the next great sea war happens. Not that there is any inefficiency, lack of smartness, or unreadiness to be feared. But until you have lived in one of her majesty's ships you can form no idea of what a conservative institution the British navy is. 'As it ever was it ever shall be' seems to be the cardinal point of faith, while Nelson and precedent are things to be sworn by. Though sail power and three deckers are gone, the impress of Nelson upon naval routine is almost as distinct as ever. The system of issuing rations to the crews is much the same now as it was at Trafalgar—imperfect, wretchedly unsatisfactory in nearly every way to modern ideas, yet, according to precedent—and, therefore, the admiralty has but just taken steps to improve it. Capturing ships by means of boarding parties has disappeared from the probabilities of naval warfare, yet in the British navy boarding parties are still trained. Not, mind you, because they are expected to be of much use, but because 'Nelson did it.'

"Evening quarters is another Nelson survival, but not a mere absurdity, like those above mentioned. It was instituted by the great admiral in order to assure himself each night that his gun crews were properly filled. It still remains only a muster of the men held to ascertain whether the divisions, foretop, maintop, forecastle, quarterdeck and marines are 'all correct.' The names of divisions are another survival, for foretop and maintop disappeared when steam replaced sail power. A curious fact, not generally known, is that the black silk handkerchief which Jack knots about his throat was first worn as mourning for Nelson, and has ever since been retained. The three white stripes around the broad blue collar of the sailor's jumper commemorate the victories of Trafalgar, Copenhagen and the Nile. Thus the Nelson legend affects not only Jack's work, but his food and clothing as well. The broad blue collar itself is older than the great admiral. It was first adopted at that period when sailors plastered their hair into a stiff pigtail with grease and powder.

"At 9 o'clock each night the sentry in every ship in harbor fires off his rifle. For the origin of this custom we have to look back to the day of flintlocks. Then, in order to test the priming and see that his weapon was in usable condition, the sentry had to fire it off each night. There is no necessity for such a test with modern rifles, but the 9 o'clock firing is religiously carried out. When our fleet was composed entirely of sailing ships a captain or an admiral was always hoisted out of his boat into the ship, and a boatswain's mate stood by on deck with his pipe to give the men the correct time for pulling on the rope. Admirals and captains now walk up ladders when entering their ships, but there is always a boatswain's mate standing at the top to pipe them aboard. Every time an officer or man climbs to the quarterdeck he salutes. The origin of this usage dates back a long way. When England was a Roman Catholic country a crucifix stood on the quarter-deck of all ships. Every time any of the crew approached this holy symbol they crossed themselves. Out of that has grown the custom of saluting the quarter-deck. The cry of 'Heave out, heave out, show a leg or a purser's stocking!' which the bo'suns' mates shout along the deck when rousing the crew of a morning, is a heritage from that period of our naval history when women were carried in our men-of-war.

"Nelson instituted what is known as mustering by the open list. It was a necessary practice in his time; it is absolutely unnecessary now, yet it is carried out regularly one Sunday in every mouth. The captain and officers assemble near a table with a number of books upon it, the men being ranged round. Suddenly a call for 'John Jones' is heard. Jones at once takes two steps, which brings him into the center of a little circle chalked on the deck in front of the captain. Raising his hand he salutes sailor fashion, then takes off his cap, looks the captain straight in the eye, and says, 'No. 41, sir, leading seaman, trained man, seaman gunner, torpedo man, three badges,' or details whatever other accomplishments he may possess. In short, Jones has to tell the captain his number on the ship's books, what his rating is, and how many badges he possesses. The captain could get this information much more quickly from his clerk if he wanted it. But mustering by open list is a naval usage no one professes there is any utility in—and therefore it is punctiliously carried out. Indeed, the regulations enforce it. What is more, the number of steps a man must take, the number in which he should lift his cap, the fact that he must step correctly into the center of the circle, and 'look the captain straight in the eye'—in short, all the clockwork motions suitable to the occasion—are carefully drilled into him."

An officer in the United States navy says that while there is no individual impress on the customs now in vogue in the United States navy, there are some things that have not changed, and that probably will remain as they are and as they were in the early days of the navy, when the present class of vessels was unknown.

"The chances for boarding," he said, "are few nowadays, but boarding drill and drill for repelling boarders must be maintained. But while nets and spikes, cutlasses and ropes were conspicuous in these drills years ago, rapid-fire guns now play the most important part. Evening muster is still held, and this ceremony will be maintained as long as commanding officers wish to keep informed as to their crews. The 'sail terms' have all disappeared, and the ships are now divided into certain 'divisions' and 'posts.' It may be that the quarter deck salute had its origin, as far as the English navy is concerned, with the cross, but in this country, where we still salute the quarter-deck, the salute is intended for the flag and for the officer. The sailor salutes instinctively when he reaches the quarter-deck, and the officer returns the salute. When the man sees no officer he salutes just the same, because the place demands his respect, and it will make little difference what changes are made in the construction of a ship, that custom will remain.

"The personal muster is also a survival of old customs in the United States navy, but it is considered necessary. It insures correct rating for the crew, and it gives the officers an opportunity to become acquainted with the men. There is no chalk circle for our men, but once a month the men are compelled to appear on deck, and, when the clerk calls for their names, to step from the ranks and give their rating. On my ship the ceremony is simple. In response to the calling of 'John Smith' a man steps forth, says: 'First-class fireman, sir,' salutes and falls in line and files past. On some ships the commanding officers have the men appear in groups—firemen, engineers, first-class seamen, etc., each by themselves. But the personal muster is not unnecessary, for, although the books show the names they do not give the man's features, and he may be rated wrongly on them. 'Piping the sides' is also an old custom which is still in vogue, despite the fact that officers go aboard and leave ship by a stairway. When a guard of marines receives an officer the piping is dispensed with, but when there are no marines to give the boarding or departing officer the proper salute, the boatswain's mate, attended by young seamen with landing ropes, do the honors, and then the 'sides are piped,' as in the days of yore. The regulations prescribe that there shall be eight boys for an officer who is entitled to a fifteen-gun salute, six boys for an officer entitled to eleven guns, four boys for a captain, and two boys for lesser officers."

In the United States navy the old practice of senior officers entering boats last still prevails, the young officers run to get ahead of their seniors. The master-at-arms is still called "Jimmy Legs," and the man who assists the paymaster in handling the supplies in the hold is known officially as "Jack of the Dust." Many years ago the smoke pipe in the galley was named "Charlie Noble," and when a little powder was put in the pipe, to blow the soot out, the sailors would refer to the ceremony as "killing Charlie Noble." The kitchen on board a modern battleship does not resemble the old-time galley, but the smoke pipe is still known as "Charlie Noble."

NEW BOSTON STEAMSHIP CO.

By special arrangement stockholders of the Boston Towboat Co. can subscribe until Oct. 18 to stock in the new Boston Steamship Co., to the extent of one-half of their towboat stock. The new company is capitalized for $650,000 first mortgage 5 per cent. twenty-year gold bonds; 6,500 6 per cent. preferred shares and 6,500 6 per cent. common shares. The entire issue of bonds has been disposed of at par, as well as 2,000 preferred shares at 83 and 2,000 common shares at 62, so that only 4,500 preferred shares and 4,500 common are offered for subscription at 83 and 62 respectively. The title to the property of the company is to be held by trustees, Messrs. John Parkinson, Frank G. Webster and Alfred Winsor. They have agreed to purchase of Kidder, Peabody & Co. two steel ocean freight steamers of 11,200 tons dead weight each, now under construction at the yards of the Maryland Steel Co., Sparrow's Point, Md. Kidder, Peabody & Co. are to pay the interest upon the bonds until Jan. 1, 1902, and also to pay to the shareholders interest at 5 per cent. upon the cost price of their shares until such time as the vessels are ready for service, which, it is expected, will be not later than Jan. 1, 1902. They are to receive from the trustees, in full payment for the vessels and all services rendered, the entire issue of bonds and preferred and common shares. The bonds may be called at 110 and accrued interest. They may be registered as to principal if desired. The preferred shares participate equally with the common shares in all dividends after 6 per cent. upon the latter. The preferred and common shares are to share equally in case of liquidation. Mr. Alfred Winsor will act as president of the company. Kidder, Peabody & Co. will issue to subscribers their negotiable receipts pending the issue of the bonds and trust certificates by the trustees. Five per cent. interest will be allowed subscribers upon amounts paid in by them from dates of payment until Jan. 1, 1902. Payments are 10 per cent. on application and 10 per cent. each on Dec. 1, 1900, Jan. 1, 1901, March 1, May 1, June 1, July 1, Sept. 2, Oct. 1 and Dec. 2. The full issue of securities has been underwritten.

PERSONAL.

President Roberts of the Roberts Water Tube Boiler Co. was in Cleveland during the present week. As a result of the success attained with Roberts boilers in the fast Sault river steamer Chippewa, which is a gem among small passenger vessels of the great lakes, the Craig Ship Building Co., builders of the Chippewa, are to use Roberts boilers in another passenger steamer of about the same dimensions as the Chippewa, which they will build during the coming winter for the Booth Packing Co. Mr. Roberts says that his company will again pay an annual divident of 10 per cent. on Nov. 1, the tenth since its organization.

Gen. Mngr. James Wallace of the American Ship Building Co. (lake consolidation) has of late seen a great deal of ship yards in different parts of the world. He says that the new works of the New York Ship Building Co. at Camden, N. J., are the greatest in the world.

Mr. A. H. Folger, manager of the Lockwood Mnfg. Co., East Boston, Mass., was in Cleveland a few days ago making the acquaintance of some of the lake vessel owners. With a large number of vessels passing from the lakes to the Atlantic seaboard, concerns like that which Mr. Folger represents will very probably find new customers. The Lockwood Mnfg. Co. is very favorably known among ship owners on the coast.

Mr. Thomas P. Egan, president of the J. A. Fay & Egan Co. of Cincinnati, has just returned on the steamer St. Louis from Europe. Mr. Egan has been abroad nearly five months, having during his visit taken an active interest in the company's exhibit of wood-working machinery at the Paris exposition. The fact that J. A. Fay & Egan Co. received the "Grand Prix," the highest award, reflects great credit on Mr. Egan and his able corps of assistants in charge of the exhibit, which was the largest of all those in the foreign section. Mr. Egan made an extended tour of England and the continent, visiting all the company's agents and incidentally getting nearer to the wants of the various countries.

The personnel of the United States Steamboat Inspection Service at the close of the fiscal year ended June 30, 1900, consisted of 177 officers, clerks and messengers, as follows: Supervising inspector-general, four clerks, one messenger, ten supervising inspectors, forty-four local inspectors of hulls, forty-four local inspectors of boilers, fifteen assistant inspectors of hulls, seventeen assistant inspectors of boilers and forty-one clerks to local boards of inspectors. The following changes have occurred in the personnel of the service during the year: By removal, eight; by death, four; by resignation, four; by promotions, two; by civil service appointments, fifteen.

Within a few weeks' time 70,000 tons of new ship construction have been ordered from Clyde yards.

TONNAGE—A TERM LITTLE UNDERSTOOD.

Of all the semi-technical terms in the whole gamut of shipping matters, none is so little understood as tonnage. The looseness attaching to the use of this word appears to be due to the fact that there are several varieties of tonnage. For example, there are net tons, gross tons, measurement tons, and displacement tons, and yet, in spite of these different tonnages, the term is frequently used without any explanation as to which style of measurement is alluded to. Probably tonnage, or tunnage as it was originally styled, was first estimated by loading up a vessel with tuns or casks used for the conveyance of wine, the number of such casks that she accommodated being the measure of her capacity. As far back as the year 1422 an act of the British parliament was passed stipulating that "keels that carry coals at Newcastle should be measured and marked." The River Wear was made amenable to a somewhat similar regulation in 1679, when it was enacted that the Bowle Tub of Newcastle, containing 22½ Winchester gallons, should be used in marking and measuring the coal craft on the Wear. It was not until 1694 that weight instead of measure was taken as the standard of a vessel's capacity. The act then passed required "keels" to be measured by putting into them iron or lead, 2 tons 13 cwt. of which was regarded as the equivalent of a chaldron of coals, while a maximum load was 10 chaldrons or 26½ tons. When a boat was so loaded the water line was painted round her hull, stem, stern and each side amidships being distinguished. These regulations, it should be noted, only referred to river craft, and in 1775 they were made applicable to all such vessels engaged in the coal trade. For the first effort to estimate the tonnage of sea-going ships, credit must be assigned to Admiral Sir William Monson. His rule "to know the burden of a ship" was to multiply the length by the beam and the product by the depth. The result he divided by 100 and the quotient was the burden or tonnage of the vessel. Thames shipwrights of the seventeenth century appear to have followed some such rule as this, except that for depth they substituted half the breadth. It is in 1694 that we find the first tonnage rule embodied in an act of parliament. For the purpose of levying dues on ships their tonnage had to be assessed, and the formula employed was the following: Tonnage $= \frac{l \times b \times d}{94}$.

The length was the length of the keel, or rather, "so much as she treads the ground." In 1720 a modified rule was adopted in which, instead of depth, half the beam was utilized. There is no need to trace the evolution of the various schemes for measuring vessels, but we may point out that a committee appointed by the government in 1821 to revise the tonnage laws, was in favor of a scheme for measuring that portion of a ship between the light and full load lines. They did not, however, advise its adoption because it was "liable to insuperable objection on account of the impossibility of ascertaining the position of these lines in a satisfactory manner." Such was the then state of the science of naval architecture. The committee which sat in 1833 was more successful and evolved the method commonly described as the "new measurement," which remained in force until 1854. The method at present adopted is, with variations, based on the plan which Mr. Moorsom suggested in 1850, and which ascertains the internal cubical capacity of a vessel. Under the present tonnage rules, it has been possible—because economical—for builders and owners to evolve the safely proportioned ships of the present day. When half the beam of a ship was a factor in determining the tonnage of a ship, there was a temptation to increase the depth and decrease the beam with the result that narrow and deep ships were built. These craft were naturally tender and dangerous to their inmates in bad weather, but at the present day they have nearly all disappeared from the surface of the ocean. Register tonnage, or rather gross register tonnage, is simply the internal cubical contents of the ship divided by 100, the register ton being 100 cubic ft. If from this space measurement there is deducted the allowances for crew and propelling spaces, etc., we arrive at the net register tonnage. Since 35 cubic ft. of sea water weighs one ton it follows that the load displacement of a vessel is simply the cubical contents of the submerged portion of the ship divided by 35. A formula which gives a fairly approximate displacement is: Displacement in tons $= \frac{l \times b \times d \times c}{35}$.

Here l is the length on load water line; b, the breadth on load water line; d, the mean draft; and c, the co-efficient of fineness, which varies, of course, with the form of the vessel. Practically. c represents the ratio of the actual displacement to the volume displaced by a parallelopipedon supposed to enclose the ship. For average cargo vessels of full form the co-efficient of fineness is .75 to .8, or even .9, but in fine high speed ships it is considerably less. Between the displacement at light and full load line there is a tangible difference, which varies with the form of the ship. This difference is the dead weight carrying capacity of the vessel, and the type of cargo ship generally aimed at is one which shall have a maximum dead weight capacity with a minimum of net register, or, in other words, which shall earn much and pay little in dues. In the case of the modern three-decker, well-decker and spar-decked steamers, the dead weight cargo carrying capacity is approximately 2 to 2½ or even 3 times the net register, while in the case of sailing vessels the carrying capacity is usually 1.7 to 1.8 times the net register.—Syren and Shipping, London.

The submarine boat Holland has been placed in commission. She is to be sent to the naval academy at Annapolis, so that the cadets may become thoroughly familiar with this modern weapon of warfare. The battleship Wisconsin, which had her initial trial on Thursday last, will probably not be complete and ready for commission before Dec. 15. The torpedo boats Morris and Du Pont are to be retained for winter use. The Adams, Ranger and Unadilla have left Santa Barbara, the first named for San Diego and the other two for San Francisco. The Scindia has sailed from Colombo for Singapore. The Albany has left Perim for Aden. The Culgoa has sailed from Sydney for Brisbane. The Dolphin is at Tompkinsville. The Fortune is at Newport.

Chief Constructor Philip Hichborn, United States navy, has been awarded a diploma and gold medal for the Franklin life buoy, Hichborn turret and models of war vessels exhibited at the Paris exposition of 1900. The chief constructor has now quite an interesting collection of medals and diplomas from national and international expositions.

CABLE SHIP ORIZABA A COMPLETE WRECK.

(From the Electrical Review.)

The Pacific Coast Steamship Co.'s vessel Orizaba, which was wrecked on Rock Point reef, St. Michaels island, on Sept. 20, is a total loss, and her captain lays the blame upon the hydrographic bureau of the United States navy, stating that the wreck was due to three large uncharted rocks where the charts drawn up by the bureau showed 36 ft. of clear water. Almost immediately after the accident a lighter came alongside the disabled steamer and offered assistance for $175 per hour, which was refused, and within two days several of the steamship company's boats were at work on the Orizaba trying to float her. As she had three large holes stove in her bottom, this was found to be impossible and the lighters at once began to remove the cable. This heavy task was accomplished on Sept. 23, and the entire cable was found to be uninjured. Mr. George F. Porter, who was with the expedition and in charge of the Kerite cable, notified Mr. W. R. Brixey, New York, on Monday morning, that he expected to finish laying the entire cable in the course of a few days. The lines to be laid run from St. Michaels to Cape Nome on the one side and to Unalaklik on the other, taking the form of the letter V, with St. Michaels at the base, Cape Nome the left terminus, and Unalaklik the right, the lines being respectively 32 and 155 miles long. Mr. Porter's idea was to charter a steam boat and run at least the shorter cable before the sound freezes, which generally occurs about Oct. 15. This undertaking is attended with great danger on account of the swiftness with which the ice moves, great bergs appearing without warning in such numbers as to make it impossible for a ship so trapped to escape, and once caught in the floes or heavy drift ice the unfortunate vessel, if not crushed like an eggshell, would be compelled to remain a prisoner all winter. It may be possible to run only the shorter cable, but it was thought at Mr. Brixey's office that Mr. Porter would probably succeed in laying both lines. Gen. A. W. Greely, chief of the United States signal service, who returned to Washington via Seattle on the day of the wreck, has refused to fix the responsibility of the wreck upon anyone, claiming that he was not an expert in such matters, but adding significantly that the Orizaba's master blames his charts. In this same connection, it is reported that important changes are to be made in the hydrographic bureau, which seems to support the belief that the charts were incomplete and imperfect.

AFTER THE GALVESTON STORM.

Mr. Charles A. Hill of Barberton, O., who has been in Galveston, Tex., during six or seven weeks past, has favored the Review with a couple of photographs from which the accompanying illustration was

made. The photographs show the steamship Kendal Castle as she lies at Texas City in 3½ ft. of water. This vessel steamed in Galveston on about 18½ ft. the day previous to the storm, and was driven six miles up the bay, dragging two anchors. Two miles at least of dredging will be required to float her after discharging cargo. She was not materially damaged, and now lies on an even keel on sand bottom.

LIGHTS ON FISHING VESSELS.

On Nov. 8 there will be a meeting in Washington, D. C., of the American delegates to the International Maritime Conference of 1889-'90, who were continued by act of congress a few years ago as a board to wind up some matters which the conference itself did not succeed in finishing. This board consists of Rear Admiral S. R. Franklin and Rear Admiral Sampson of the navy; S. T. Kimball, general superintendent of the life-saving service; Judge W. W. Goodrich of the New York supreme court; Clement A. Griscom, president of the International Navigation Co., and Capt. John W. Shackford of New York. Eugene T. Chamberlain, chief of the bureau of navigation, treasury department, acts as secretary of the board. It will be recalled that the conference succeeded in effecting a revision of the international rules to prevent collisions at sea, the revised code having been adopted by the nations which were parties to the conference; but no agreement was reached as to the lights to be carried on fishing vessels. This is not of so much importance to fishers in the United States as to those of Germany, Holland, Great Britain and other nations which have considerable fleets in the German ocean, the English channel, etc. These nations giving no promise of getting together otherwise, Great Britain has herself prepared a set of rules, a copy of which has been forwarded to the other nations interested in the conference, and now each of these will pass upon the British code and indicate its approval or non-approval separately. Our fishing vessels, which are found in greatest number on our northerly ocean banks, will be affected by these new rules, of course, but those of a general character do not differ essentially from the rules now prevailing. The most important changes made by the British code are in reference to vessels engaged in trawling, an operation in which American fishermen engage very little. If the several nations concerned agree to the English proposals our secretary of the treasury will recommend the enactment of a law by congress authorizing the president to promulgate the new rules for the United States upon the exchange of ratifications.

A company known as the Benemelis Steamship Co. has been organized at Mobile, Ala., to operate a line of steamships between Mobile and Vera Cruz and Tampico, Mexico.

NEW SYSTEM OF WIRELESS TELEGRAPHY.

(From the New York Sun.)

Probably the most important step in the advance of wireless telegraphy toward practical use is that which has just been made by Marconi. The old system—for it may be called old now that an entirely new one has replaced it—consisted of an elaborate set of instruments and apparatus, the chief external evidence of which was an aerial wire suspended from a tall mast. It was in the height of the mast that the virtue of the system was supposed to exist. Marconi discovered early in his career—and yet only a few years ago—that if he doubled the height of his mast he could send messages four times as far. It was the so-called law of squares for ether wave effect. For example, he found that he could telegraph 100 miles if his aerial wires were 150 ft. high at the terminals. It was easy to compute the height required for crossing the Atlantic with ether waves—a wire suspended 750 ft. above the transmitting station would, according to the calculation, send a message 2,500 miles—and extravagant predictions were made, based upon the possibility of establishing communication between the Eiffel tower in Paris and a huge structure in New York or Washington. Some thought that, if the average height of the two aerial wires were 750 ft., messages could be exchanged. But, alas for scientific prediction that is not based on experiment. No one tried the proposed plan, not even Marconi, who succeeded in proving the law of squares in every attempt he made, but it may have been noticed that Marconi was not one of those who made the Atlantic crossing prediction. Now all this has been changed. The aerial wire and the tall masts are done away with, just as static electricity was replaced by chemical electricity and chemical by electro-magnetic. Marconi has already telegraphed 60 miles with a cylinder 4 ft. high instead of a mast and wire 125 ft. high.

As long as last January Marconi began to work on the cylinder plan. The experiments began in his laboratory at Poole harbor, first from room to room with receivers only one one-thousandth part as sensitive as the one he used for regular work between France and England; then he took his apparatus out of doors and, for several weeks along the beach, he went through hundreds of experiments, gradually approximating the proper relation between receiver and transmitter, until perfect messages were finally sent across to the Isle of Wight, 18 miles away. He did not tell outsiders of this success, because he felt he must first perfect his apparatus and plans, and that the new system was better than the old. In essential arrangement and working the cylinder plan is not greatly different from that of the aerial wire. The transmitting instruments are practically the same, a battery induction coil, earth wire, etc., the only change in this part of the apparatus being the introduction of resistance coils where needed and an arrangement for sending "tuned" messages. But on the outside of the room which contains these nothing is to be seen. The cylinder stands close at hand, upon a table, it may be, insulated from any earth connection except through the transmitting instruments when in action. The receiving station presents the same appearance; indeed, the stations are all alike, being fitted to send and receive messages in the same room. When a message is being received, the wire leading to the cylinder is disconnected from the transmitter and attached to the receiver. This arrangement is used, of course, only when a single installation is in operation. With the apparatus for differentiating between messages, which Marconi has worked out, a number of installations may be working together in the same room or building, and then it is possible to send and receive just as many different sets of messages as there are instruments differing in capacity. But this is a further step, and just now Marconi is busy with the perfecting of the cylinder plan on one installation.

Just how the messages are sent is more of a puzzle now than ever. Formerly no one doubted the statement that ether waves constituted the element of communication. Now this is being questioned. Why not earth currents? suggest some, and the inquiry is not easily answered. The production of these high tension impulses might easily disturb the electric equilibrium of the earth, it would seem, and the very sensitive receiver in electric harmony, so to speak, with the transmitter would record this disturbance just as it occurs—in long or short impulses, or in dots and dashes as they appear on the recording instrument. Of course, if this be true, any properly arranged receiver can take the message, provided it is within range, but the same fact is evident in the old system. That difficulty is obviated, however, by the syntonic apparatus, which makes it impossible for a receiver not exactly in tune with the transmitter to receive the messages sent. One may judge of the difficulty in finding the right electric "tune" when one realizes that these high tension vibrations vary from millions of vibrations to trillions a second.

It is interesting to note that 400,000,000,000 vibrations in the ether a second produce light and some trillions a second produce the X-ray. To the theory that this wireless telegraphy is carried on through the earth, that is, by disturbing the earth's electric equilibrium, the objection arises that such disturbance would affect near-at-hand wire or cable telegraph systems, dynamo power houses and all sorts of electric operations. Not so, necessarily. Sound waves and light waves do not conflict because their rates of vibration are different. These high-tension vibrations of millions a second should not disturb vibrations which are lower, as are telephone vibrations, for example, or light vibrations, which are higher. It is true that any disturbance of the earth's electric equilibrium will to an extent affect electric operations on the earth's surface, but this is not a large factor and the difficulties can probably be easily overcome.

But it is not best to be too sure as to the nature of the operation. Marconi has given months of thought and experiment to just this problem, and it is doubtful if he even is sure of what the force really is. Tesla has made many predictions in connection with transmitting electric power in just this way. His plan meant simply that he would kick the earth electrically, and the power put into the blow could be picked up anywhere on the surface of the earth if the proper detecting and collecting apparatus was used. A Frenchman has recently come forward with another plan quite similar, and the French government is trying to carry out his ideas. He proposes to test the earth's surface at a large number of places in France and find spots equal in electric capacity, or by digging down far enough in the necessary places reduce all these spots to an equal capacity. Then a disturbance at any one will be noticeable at all of the others. It is a simple matter then to create a disturbance of short and long duration as desired and thus reproduce the Morse code. The difficulties here are also very great. A rainstorm, for example, in one section of the country would be sure to change the electric capacity of the earth in that neighborhood.

It is with relief, then, that we turn to a plan such as Marconi's, wnich seems applicable to all conditions. Whether it works through the ether above the earth or through the ether in the earth or by a disturbance of electric equilibrium in the earth does not matter so much as the fact that results are actually obtained. "It works," says Marconi, "and that is enough."

C. B. ORCUTT ON OUR FOREIGN SHIPPING.

Discussing recently the subject of the foreign shipping of the United States, Mr. C. B. Orcutt, president of the Newport News Ship Building & Dry Dock Co., said:

"The foreign carrying trade of the United States is a magnificent gold mine to foreign ship owners. It yields them annually the enormous sum of over $165,000,000. Congress has been appealed to year after year to enact legislation which should so encourage the ship-owning industry as to save at least a portion of this vast sum to our own citizens, but time goes by, nothing is done and the drain continues. There is one, and only one, remedy that is feasible, and that is reasonable bounties. Until it is adopted, we must be content to see 90 per cent. of the foreign carrying trade in foreign hands, and pay to foreigners the enormous tax represented by the figures I have mentioned. This tax, too, is an ever increasing, not a diminishing one. The volume of our foreign trade is jumping up every year to figures that amaze the world, and as it grows, so of necessity must the transportation charges on it increase. The markets of the world are now very nearly at our command. It is folly to have the carriage of commodities to them in the hands of others. But independently of the mere money loss there is another evil which it behooves a wise statesmanship to look at, and that is the peril it places us in as an exporting nation in the event of foreign wars. In the present state of international law our goods are liable to capture. With adequate means of doing our own carrying trade, that peril is averted. Thus it will be seen that every material interest is concerned in securing independence on the ocean. We are at the mercy, I may say, of the European powers. While they are at peace we are reasonably safe, but let war come and insurance and war risks would soon eat up the profits on our exportation, ruin capital and bring untold distress on millions of citizens. Another phase of the question is that in the event of war with a European power we should be greatly weakened in not being able to fall back on a powerful commercial marine of our own. Our navy is all right, but with a great commercial marine to supplement it, both in ships and men, it would be practically invincible as against any power on earth. The fact is such a marine would be a peace preserver, and put us in a position so impregnable that no power would dare interfere with or even to threaten us. I am not talking from an interested point of view. I represent ship building interests, not those of ship owners, and we have all the work that we can do; but I want to see the flag on every sea, and I should like to see a first-class ship yard in every spot along the coast line of the two oceans where there are adequate facilities for one. The encouragement of ship building and ship owning was the early policy of our government, beginning with the very first administration. Thomas Jefferson made a report on our foreign commerce which is ranked as one of the very greatest of all our state papers. And, again, there is his report on the whale fisheries, in which he strenuously urges their protection by bounties and discriminating duties. His arguments of a century ago are as sound and as applicable to the existing situation as they were then."

LARGE REPAIR JOBS AT NEWPORT NEWS.

Newport News, Va., Oct. 16—In the rebuilding of the North German Lloyd liner Main, which was burned with other vessels in the Hoboken fire of July last, the Newport News ship building company has a job that will employ a large number of men. The Main arrived here a few days ago. She was towed down from New York. Although everything above water was destroyed, her machinery, curiously enough, escaped almost entirely without injury. It was said that she might have come down under her own steam, but this was not done, as the handling of a vessel in the condition of the Main on such a trip is at best a difficult and delicate task. This is the largest repair job that the Newport News yard has ever undertaken, as the ship will practically be rebuilt. The cost will be between $600,000 and $700,000, or nearly one-half the original cost of the Main which was about $1.500,000. The Main is of 10,200 tons register, 500 ft. between perpendiculars, 525 ft. over all, 58 ft. beam, and 37 ft. deep.

The United States army transport Buford, which is also being rebuilt here, will be ready to leave about the last of October. Work on this vessel is being pushed night and day, and the repairs, including the electric light system, refrigerating plant, and other extras, will cost almost as much as a new ship of her size and class. The Buford is practically a new ship as she stands. This was the largest repair job the ship yard had ever secured previous to the order for the Main repairs.

The United States monitor Arkansas will be launched about the first of November. The work is well advanced, and although the exact date has not been announced, it is understood that it will be early in the month. A sponsor for the ship has not yet been selected, but Secretary Long will probably request the governor of Arkansas to name the young lady who will christen the ship. This is the third type of warship to be turned out here—first the gunboats, then the battleships and now the monitor.

The new dry dock is rapidly nearing completion, and will probably be ready for service about the first of the year. The concrete and timber work is nearly finished, the only remaining work being the completion of the gate mechanism and the installation of the pumping equipment. This will be the most important dock on the continent when completed, and in fact will compare very favorably with any dock in the old world. As soon as the new dock is completed the management contemplate overhauling and thoroughly examining the old dry dock, which was built about twelve years ago.

Laird Bros., Ltd., Birkenhead, England, made $110,000 in profit last year. This sum is less than the average of preceding years, owing to the high cost of materials and the fluctuating market.

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American trade with China shows a more rapid growth than that of any of the European countries. Last year the exports from the United States amounted to 22,288,745 taels against 5,093,182 taels in 1895. Thus in four years the imports into China from the United States have more than quadrupled. During the same period the imports into China from Great Britain increased from 33,950,060 taels to 40,161,115 taels. In other words while the percentage of increase from Great Britain has been 18 the percentage of increase from the United States has been 337 per cent. A tael is worth 72 cents in American money. It is as clear as sunlight that this commerce is to increase rather than diminish. Already ships are under way in various yards to care for it. Trade will flow orientward in a greater stream than ever as soon as the present trouble with the Chinese is at an end. There is little doubt but that the dowager-empress is at the bottom of the present disturbance. 'Tis an ancient grudge with her, for forty years ago these same foreign devils burned a palace about her ears and sent her flying into the Chinese wilderness. No career, ancient or modern, sacred or profane, is more varied or more wonderful than the career of this extraordinary woman. Joseph of the Pharaohs is apparently a parallel, but is not as striking; for Tsze Hsi, dowager-empress of China, has achieved the impossible. It is all summed up in the sentence that a woman rules the empire. In no country in the world are women held in such contempt as in China, and yet this woman was a slave. She was sold into slavery in her childhood by her own father. It is to be noted, however, that she proposed the sale in order that the family might obtain food. She was purchased by a merchant in Canton and being a slave was granted a larger liberty than would have been accorded her had she been his daughter. She learned to read and write—an accomplishment which few Chinese women even to this day possess—and was permitted to do the marketing. The emperor of China was married, and his wife was in favor, but alas, she had no son. Proclamations were therefore issued directing all eligible Manchu maidens between the ages of fifteen and eighteen, who desired to become secondary wife to the emperor, to report to the palace. On her way to the market the slave girl saw the proclamation and read it, and she made known her desire to her master to compete for the position. He was profoundly astonished, but in order to assist her as much as possible promptly adopted her as his daughter. She entered the lists and with rare instinct sought to win the favor of the empress. She succeeded, and through her gained the favor of the emperor. She became the mother of the present emperor of China, and through her consummate skill and vast ambition the ruler of 400,000,000 of people.

No subject which has come before congress latterly has been more exhaustively exploited than the shipping bill. A deal of research has been put upon it. Its literature is rich. Several senators and representatives gave practically a whole session to its consideration. Senator Frye became so immersed in the subject that he was enabled to combat any argument at a moment's notice. He was the breathing encyclopedia on shipping. Such lavish sowing of seed must bear fruit. The harvest is likely to be reaped at the next session of congress. At that time the presidential campaign will be out of the way and the subject can be soberly treated from the economic standpoint and not from the political. The iron's hot at present, and the time to strike is now. Several abnormal conditions, principally wars, have tended to stimulate American shipping. There has been a shortage of tonnage and several vessels have been built to supply the demand. It requires a shipping bill to make this temporary advantage permanent. Unless the American merchant marine is placed upon an equal footing with the merchant marines of other countries it must of necessity perish in the end. It cannot fight against odds and win. It may reap a chance profit but the end is inevitable disaster. With a fair field, however, the American merchant marine will eventually be restored to the high seas. The United States is today the leading export nation of the world. With its goods going abroad in its own bottoms it will retain the joint profit of manufacture and carriage. Both are distinct avenues of industry and one is just as important as the other. The United States today has only one, for 91 per cent. of its shipping is controlled by a foreign nation. The shipping bill should be taken up as soon as congress convenes; it should be passed before it adjourns.

With the single exception of Japan the United States is the only nation which has a modern cruiser to display as a trophy of its prowess. The Reina Mercedes, captured from Spain at Santiago, is now at the Portsmouth navy yard, where she will probably remain for many generations to come. Although there is no money available at present to repair her, congress will doubtless set aside a specified sum for that purpose. She will doubtless be a valuable object lesson to the rising generation.

CONDITION OF REVENUE CUTTER BACHE.

Rear Admiral Hichborn, chief of the bureau of construction and repair, has made some interesting comments upon the report of the naval intelligence office upon the condition of the revenue cutter Bache. The report is to the effect that the sheathing is in bad condition. Rear Admiral Hichborn shows in his comments that the vessel was built in 1871 and that it was not sheathed until nine years later. When the sheathing was applied the bottom plating had suffered seriously from corrosion and there is no reason to believe that it could have been properly freed from rust and scale. Concluding his report he says:

"To summarize, it may be stated that this vessel, not originally intended to be sheathed, was nine years after her launching fitted with a system of sheathing which involved a neglect of some of the most obvious precautions in such work, and the use of iron bolts, and in the execution of which the workmanship was bad. She served thirteen years continuously without an examination of, or repairs to, her sheathing or sheathing bolts, and is today in active service, though nearly thirty years old, with her frames and plates in such a condition through internal corrosion in the machinery and bunker spaces as would have long since compelled her abandonment or extensive rebuilding had she not been sheathed, without the sheathing applied twenty years since having been renewed or the bottom plating 'sighted' or repaired. That these results are possible under such conditions speaks volumes for the possibilities of an efficient system based upon experience (in which every precaution is taken and neutral non-corrosive naval brass bolts are employed), executed with scrupulous regard for the highest class of workmanship, in a service where periodical examination and proper care is fully provided for."

ITEMS OF GENERAL INTEREST.

The navy department has asked the war department for a tract of land adjacent to the naval station at San Juan with the idea of extending the station. The government has $50,000 at its disposal for San Juan and will expend the sum for an electric light plant, coaling facilities and a pier. Bids will shortly be invited.

A naval board appointed to examine the old frigate Constitution has reported to the navy department that it will cost about $400,000 to place that vessel in a condition such as is contemplated by the Boston patriotic society which is raising a fund for the rehabilitation of "Old Ironsides." It is estimated that $350,000 will be necessary in the construction department.

Ship draftsmen of the Bath Iron Works, Bath, Me., have taken a lead that might be followed to advantage in other large works throughout the country. They have formed an association, meeting once a week to discuss ship building matters for mutual benefit. "Our society is a very unpretending affair," says one of the members, "with little of the lecture about it—just a weekly chat—but we are expecting that a great deal of pleasure and profit will result from our meetings."

The Fall River line sound steamer Pilgrim is to be fitted with new boilers at a cost of about $150,000. The Pilgrim's engine is single, 110 in. diameter of cylinder by 168 in. stroke, and the boilers now fitted have about 19,000 sq. ft. of heating surface and work at 50 lbs. pressure. The indicated horse power of the vessel is 3,000. The Pilgrim, once the queen and greyhound of the sound, is a slow boat now when compared with the magnificent and speedy Priscilla and Puritan of the same line.

The new Atlantic liner Bohemian had a successful trial trip a few weeks ago. She was built by Alex. Stephen & Sons, Linthouse, Govan, for the Leyland line. She is 512 ft. long, 58 ft. beam and 45 ft. deep; gross tonnage, 8,600; dead weight capacity, 10,700 tons. Her engines have cylinders 32, 54 and 90 in. diameter, with 66-in. stroke. Scotch boilers are fitted, working with Howden draft at 190 lbs. pressure. The Bohemian has excellent accommodations for 107 first-class passengers.

It is said that the Joy Steamship Co., which has been running a freight and passenger line from Providence to New York, in opposition to the Providence line, will carry the battle to Newport next season. The Joy company is now negotiating for wharfage at Newport. They have several sites in view, but none has been secured. If the plan contemplated now is carried out, the Joy line will run two passenger steamers to New York next summer, and they will run on alternate days, stopping at Newport for both passengers and freight.

Consul Smith writes from Moscow that in March last the Russian government decided to construct new dry docks in Vladivostock, which will be capable of admitting ships of 700 ft. in length. The excavations for these docks are now being started. Near the docks will be constructed two large metallic ship building yards capable of turning out ships up to 3,000 tons. The old dock, the "Tsarevitch," is being rebuilt, and six new boilers have been ordered therefor. The work is superintended by Military Engineer Savitzky, with three assistants. The government has also decided to construct and equip sixty new mechanical shops.

Monthly blast furnace statistics prepared by the Iron Age of New York show that, in spite of a further reduction in the capacity of the coke and anthracite stacks working, which amounts to 9,630 tons weekly, there has been a further accumulation of stocks by about 26,000 tons during September. Blast furnaces of the country are now making pig iron at the rate of less than 11,500,000 tons per year, as compared with a rate of over 15,000,000 tons per year on June 1, when the maximum was reached. Since then furnace stocks have gone up from 300,000 tons to double that quantity. The statistics do not include the stocks of metal at the great steel works, which may have increased. As against this apparently adverse statistical situation there is the undoubted fact that the stocks in the hands of consumers have been cut down to a very low figure. The frequency with which melters enter the market for iron for prompt delivery is very conclusive proof that such is the case. Unfortunately it is not capable of being given numerical expression.

ATLANTIC AND PACIFIC COASTS.

A NUMBER OF IMPORTANT LAUNCHES HAVE OCCURRED DURING THE WEEK AND A FEW NEW CONTRACTS ARE NOTED.

The six-masted schooner Eleanor A. Percy was launched from the yard of Percy & Small, Bath, Me., on Wednesday of last week at high water. She is 300 ft. on keel, 50 ft. beam, 24 ft. hold, and is expected to carry 5,500 tons of coal. The Percy is named in honor of the daughter of S. R. Percy, senior member of the firm of Pe cy & Small, the builders, and will be the second six-master afloat. She is to be commanded by Capt. Lincoln W. Jewett of South Portland, formerly of the schooner Charles P. Notman. Ever since work has commenced on this vessel and upon the six-master George W. Wells, launched some weeks ago at Camden, there has been a friendly controversy over the relative sizes of the big schooners, each town claiming their's the largest. It is therefore interesting now to compare the dimensions. The Wells' dimensions are: Length on keel, 302 ft. 11 in.; beam, 46 ft. 6 in., and depth of hold, 23 ft. Her carrying capacity is placed at 5,000 tons. From these figures it would seem that there was very little difference between the two six-masters, but, if any, as regards carrying capacity, what difference there is, is in favor of the Percy. The first vessel launched, it will be noticed, is a trifle longer on the keel.

The four-masted schooner Edward Stotesbury was launched last week from the yard of McKay & Dix, Bucksport, Me. The Stotesbury is double-decked, 1,446 tons gross, 1,277 tons net, 210 ft. long, 41.6 ft. beam and 21.6 in depth of hold. She is designed for the general carrying trade. Her frames, ceiling and decks are Chaleur spruce, and her planking, waterways, etc., of southern pine, all of very heavy dimensions. She has under every beam wrought iron combination hanging knees and strapping. The masts are of Oregon pine, 108 ft. long, while the schooner carries a spike bowsprit and steel standing rigging. She has a complete equipment of steam gear. Capt. Charles B. Dix of New York is the managing owner, the other owners being W. F. Hager & Co., E. T. Stotesbury and others. She will hail from New York, and will be commanded by Capt. Darrah, formerly of the schooner Edith L. Allen. She already is chartered to load 7,500 barrels of refined petroleum, Philadelphia to Liverpool, at 5s., the highest freight paid between those ports in twenty years.

A contract has just been signed by the Union Iron Works of San Francisco for a fine new coasting steamer for the Pacific Coast Steamship Co., which is to be delivered next spring and to bear the name Spokane. The vessel will be one of the best appointed vessels of her kind on the Pacific. She will be used in the passenger and freight service. The vessel will have a double bottom and several bulkheads. Her length will be 270 ft.; beam, 40 ft., and depth of hold 19 ft. 6 in. Her freight capacity will be 1,350 tons, deadweight, and she will be fitted with a refrigerating plant, for the purpose of carrying a full supply of stores from San Francisco, to last the round voyage. The machinery will be of the triple-expansion type, and with large boiler power she will have a sustained sea speed of 15 knots an hour. Electricity will play an important part in her equipment. The vessel will be lighted by electricity, and there will be electric hoists for taking in and discharging cargo.

The new steamship Sierra, built by the Cramps, Philadelphia, for the Oceanic Steamship Co., returned to Cramps' ship yard last week from a successful trial trip, during which she developed a speed of over 17 knots an hour. She is the first of three vessels building for the line, the others being the Sonoma and the Ventura. The pioneer vessels of the Oceanic service were the steamships Mariposa and Alameda, also built by the Cramps. They have been the most successful vessels that have ever left any of the Delaware river ship yards, considering their voyages, which cover 14,000 miles, stopping at Honolulu, Samoa, New Zealand and New South Wales, and during many years of constant work have never had a breakdown or paid a cent in salvage. Besides this the Oceanic company's vessels are the only merchant steamers ever seen in Australia flying the stars and stripes.

There are laid up for the winter in the basins of the Gas Engine & Power Co. and Charles L. Seabury & Co., at Morris Heights, the following steam yachts: The Toinette, owned by E. E. Smithers; Margaret, J. H. Rutherford; Amabel, J. Campbell Smith; Hirondelle, J. F. Zimmerman; Reva, Geo. L. Ronalds; Raynham, E. S. Woodward; Calypso, Mrs. Julia Curtis; Genevieve, D. D. Fiske; Allegra, Chas. M. Pratt; Franeda, Frank Bement; Halcyon, Hiawatha, Julius Fleischmann; Wachusett, Edward Weston; Hildegarde (auxiliary), Blakeley Hall; Marjencha, Dr. H. A. Mandeville; Rex, Alexander Stein, and Eleanor, R. W. Cummings.

The board of naval bureau chiefs has decided by a vote of four to one to postpone the date of opening bids for new battleships, set for Nov. 15, until Dec. 7, when the bids for cruisers also will be opened. Rear Admiral Bradford dissented from the postponement. He is understood to desire the matter disposed of before congress meets. The postponement was desired by some of the large ship builders in order to give them time to prepare individual plans, which have been invited. It also will permit naval officials to consider several plans for changing the batteries heretofore agreed upon.

For years the building of sailing vessels has been on the wane in the state of Delaware, where formerly the best types of wooden craft were constructed mainly of oak. Recently there has been a tendency toward a revival of building and last week a four-masted schooner for Capt. J. S. Davis was launched at Milford. The craft, which is named George May, will carry 1,300 tons on a draught of 15 ft. She cost $14,000. She will engage in the southern and West India trade.

There seems every prospect that Richmond will have another ship yard. The Petersburg Iron Works, Petersburg, Va., recently purchased land below Richmond with more than a mile of river front. Officers of the company say the iron works will not be moved from Petersburg, but practically admit that they will establish a ship yard. The river opposite the site purchased is deep enough to launch anything except a battleship.

The Ward Engineering Co. of Charleston, W. Va., is building a new packet, which is to run in the Ohio and Kanawha river trade between Charleston and Pittsburg. The steamer is built with the view of making rapid time, and will have machinery different from any now in use on western rivers. Instead of a paddle wheel it will have screw propellers, steel hull and Ward water tube boilers.

The New York Ship Building Co., Camden, N. J., is in receipt of contracts to build two large steamships for the American-Hawaiian Steamship Co. One of the vessels is to be similar in size to the three building for the same company at Roach's Ship Yard, Chester, Pa., and the other is to be a much larger vessel. The Camden works now has three ships under order.

It is announced that the Maryland Steel Co., Sparrow's Point, Md., has been awarded a contract to build two large steamships for the Atlantic Transport Co. for service between New York and London. These ships will be among the very largest ever constructed in this country and are the first vessels for the Atlantic Transport Co. to be built in this country.

William F. Palmer, formerly principal of Bristol academy, has ordered a four-masted schooner to be built at Rockland, Me. The vessel will be named the Baker Palmer, and will be used in the coal trade.

The steamship American, built at Roach's Ship Yard, Chester, Pa., for the American-Hawaiian Steamship Co., was given a trial trip last week. No attempt was made to secure high speed on the initial trip.

A new vessel in the Pendleton & Carter yard at Belfast, Me., will be called the Pendleton Sisters in honor of Capt. Field's Pendleton's six girls, and will be ready for launching about Oct. 25, full rigged.

The Louisville & Evansville Mail Line Co. has contracted for the construction at Howard's ship yard at Jeffersonville, Ind., of a fine new steamer to cost $35,000.

Mr. C. B. Orcutt says that the Pacific Mail line's new 18,500 ton twin screw steamers building at Newport News, Va., will bear the names of Siberia and Corea.

On Oct. 4 the Pusey & Jones Co., at Wilmington, Del., launched a new steel barge for the Rockland-Rockport Lime & Cement Co. It is known as No. 5.

SHIP BUILDING AT OAKLAND, CAL.

The importance of Oakland, Cal., as a sea port is gradually coming to be recognized among sea-faring men along the Pacific coast. One of the most important features of her development in this direction is the ship building industry which has sprung up along the estuary. This industry is yearly assuming larger proportions. Already it occupies quite an important place in the industrial life of the city, giving employment to about 150 men at good wages, requiring large shipments of material and attracting large quantities of shipping and many sea-faring men. During the past season there have been nine vessels launched from the Oakland yards. Of these eight have been built by the firm of Hay & Wright. The other, a large flat bottomed stern wheel river boat, for a sugar refining company, was built by John Dickie, who recently opened a ship yard on the south side of the estuary. The vessels built at Hay & Wright's are as follows:

The schooner Commerce of 621 tons burden, built for M. Sanders; the schooner Luzon of 512 tons burden, built for the island trade, M. Sanders owner; the schooner Robert R. Hind of 520 tons burden, built for Hind, Ralph & Co.; the schooner William Olsen with a capacity of 491 tons, built for William Olsen; the steamer Charles Nelson of 1,057 tons capacity, built for Charles Nelson; the schooners Expansion and Philippine of 512 and 891 tons respectively, both built for M. Sanders; the steamer Kraulani of 900 tons burden, built for the Wilder Steamship Co.

Besides the vessels already launched there are four more now being built and several more will probably soon be started. Hay & Wright now have two vessels receiving decks. One is a steamer of about 900 tons burden, being built for the Inter-Island Steam Navigation Co. The other is a schooner built for M. Sanders after the same model as those used in the construction of the schooner Commerce. Mr. Dickie is also at work on a vessel, a large steam schooner for J. C. Beetle, while F. Petersen is building a large dredger at the foot of Castro street on the Oakland side of the estuary. Though this last might not be classed as a regular vessel it is quite an expensive craft and will probably lead to the construction of other vessels at this point.

The ship building firm of William Boole & Sons has also opened a yard on the water front and will engage in the building of vessels.

SHIP BUILDING AT JACKSONVILLE, FLA.

A dispatch from Jacksonville, Fla., dealing with ship building at that point is as follows:

For the distance of a half mile of the river front the work of building and repairing boats, steam tugs, yachts and sailing vessels is going on, and work is being furnished for numerous ship carpenters, painters and other artisans. At the works of the Merrill-Stevens Engineering Co. the full force of employes is kept constantly busy, and, although the firm has no contracts for the building of new boats at present, they have as much repair work as can be done in several weeks, and the scene around their works is one of activity. The firm is now repairing the Narciso Deulofen, United States government tug, stationed at Havana. Another steamer at these works is the Biscayne, belonging to the Jacksonville Towboat Association. The Biscayne is also an old Spanish prize boat. The boilers and machinery of this steamer are being taken out, and will be replaced by an entire new outfit. The Biscayne formerly belonged to Capt. Harry Fozzard, who purchased her from the United States government. She is a thorough sea-going steamer. The schooner Sarah E. Morse, that was water-logged and abandoned after she had gone ashore south of Palm Beach with a load of lumber, is also being repaired by the Merrill-Stevens Co.

At Rogers' boat yard, corner of Market and Bay streets, a steamer is being built for Cuban waters. This is the steamer Jessie McQuarrie, belonging to Capt. M. D. McLennan of Nuevitas, Cuba. This boat is well under construction, and will be 60 ft. long, 12 ft. beam, and will draw 3 ft. of water when loaded. The McQuarrie will be furnished with a 35 H.P. engine and will be capable of making 12 knots an hour. She will be schooner rigged and have two masts. At the ship yard of Al. McCabe a new naphtha launch is under way. This boat is being built for Porcher L'Engle at a cost of $2,000, and will be finished in December.

LANGUAGE OF THE LIGHT-HOUSE.

A WELL-WRITTEN STORY OF AIDS TO NAVIGATION AS MAINTAINED BY THE UNITED STATES LIGHT-HOUSE INSTITUTION.

LOUISE LYDON SIBLEY IN BOSTON TRANSCRIPT.

The silver star that appears in the east at nightfall at the top of some tall, off-shore tower, is the accepted "light in the window" of romance and poetry, guiding the sailor home. It it disappear and reappears at regular intervals it is the more or less familiar "revolving light." But any short sweep of coast line will show up unaccountable lights extremely picturesque and decorative from a landsman's point of view. A white star and a red star, and a flashing red star and one shining serenely white awhile and suddenly throwing out red. It looks like a puppet show of lights, each one wound up to play its own pretty part. The reason for all these differences lies far behind the obvious common need of warning seamen. It is not enough that the navigator is warned of his approach to land by the light he sees; he must be told, positively, his exact position on the map, or more than that, he must be told in time to shape his course rightly before he comes dangerously near shore. He wishes to know the position of the light by what it tells him when he sees it, with but a few seconds to spare. Otherwise he may fall into the trough of the sea where a wall of water hides it as he agonizingly tries to count it down to certainty, or a sheet of spray may hide it as he peers, or the ghostly sail of an invisible ship obscure it wholly. In storm and wind and spray he is trying, for instance, to find out whether a certain light that looks fixed is going to have a flash in two minutes, for if it does it may be Montauk point, and probably is, since another one he has just seen seemed to flash three times white and once red, and was, therefore, probably Gay Head. But he cannot toss along safely very far counting as he goes to find if it may not perhaps be plain white Shinnecock he sees, so something is wrong with the system.

Among all these characteristics that give individuality to a light it is proved that a fixed light of great power is, from the point of view of visibility, the best light. "It is kept constantly in view and a bearing can be taken from it and a course steered to it with absolute certainty when it is once picked up." The same cannot be said of a combined fixed and flashing light, nor a colored light, nor a light of slow revolution. Still, it is held that a short, sharp flash hits the searching eye of the seaman at a greater distance than the steady light, and so becomes the better beacon if the flashes are extremely rapid and secure for the light a positive characteristic. The characteristic at Boston light, for instance, is a white flash every thirty seconds. From its full front flash, of several seconds' duration, it dims slowly till it disappears, then it slowly brightens back to its center again. Now and then at lighting up time, and before the machinery is properly trained down, the flashes jump round with astonishing liveliness, giving a very fair imitation of the "lighting light," and certainly hinting at what might be done under a new system of timing the flashes.

CRUDE LIGHTING OF HALF A CENTURY AGO.

It has long been the dream of light-house engineers to perfect a beacon which should dot out its signal telegraph-wise, since every seaman, even a color-blind seaman can count, and presumably read the key he carries, the government sailing lists and charts. Consequently the best light of the future seems to be the "feux éclairs" of French engineers, of which Minot's is a fair example. Col. Heap, light-house engineer of the great third district, has demonstrated the peculiar inefficiency of many famous lights along the coast that display a flash at long intervals. It has become pressingly necessary to change all this, to hurry up the flashes and to make the eclipse a total eclipse. The change from bonfire beacon to light-house beacon at the very first meant lessening the penetrating power of the light itself. Brilliance was temporarily sacrificed for the more enduring shine. The bunch of tallow candles at Boston light might have been mistaken for a house light had it not hung in the sky at the top of a tower, and so made its mission sure. And there was no room in the stuffy little lantern for the many candles that might have made a trifle brighter light. But such as it was it served the seamen acceptably for nearly a hundred years. Candles gave place finally to a single little solid-wicked spider lamp, burning fish oil, and probably suspended by chains from the dome of the lantern, making but a poor show through the web work of casings that framed the small, dim panes of glass. Then the government fitted up all the new towers with what was hopefully called a "magnifying and reflecting lantern." This ambitious apparatus consisted of a sort of Argand lamp backed by a conically crude, un-parabolic metal reflector not brighter than a tin-pan, and said to have been no more nearly correct in form than a barber's basin. A bull's eye of bottle-green glass, set up in front of the lamp pretended to have a valuable magnifying power, and held its own in obscuring the light for many years before it was found out. Reflector and bull's eye, both discarded eventually, as "making a bad light worse," an improved type of lamp was substituted, backed by a heavily silvered reflector, made on true optical principles. Lanterns were better planned and glazed and ventilated, and by 1850 an excellent light could be shown under the best conditions of position and caretaking. Sperm oil and lard oil gave satisfaction as illuminants till much later than this. "Earth oil," considered as early as 1807, and much feared on account of its explosive nature, was avoided on account of the "great volume of smoke" it produced.

As matters stood in 1850, some lights were good, others were not Complaints piled up before the government authorities till the thing to do seemed to be to change over the whole system of lighting and administration on the lines of continental methods. The Fresnel lens, finally adopted in 1852 throughout the service, taking the place of reflectors, saved oil, gave more light and insured a greater degree of reliability, the most important thing concerning a light. With this apparatus an ordinarily capable keeper could have excellent light, and a poor keeper, if he followed the simple directions provided, could hardly have a bad one.

THE FRESNEL LENS.

A first-order Fresnel lens, which weighs a big ton, and is roomy enough to hold a dozen men, looks like a fantastic glass bee hive with a lamp in the middle. The somewhat misleading word "lens" does not promise that it shall be in familiar concave lens shape, although an extremely modern type, the "bivalve lens," closely resembles it. The common form of Fresnel lens is the working part of what would be an enormous and wholly unwieldy concave lens. In a series of detached prisms curved round a central bull's eye a lens panel preserves the so-called "skin of the lens," the outer and inner surfaces which exert the bending power on rays of light passing through. The panel does exactly what a little dark lantern does in gathering the rays of light behind it and sending them forth in a level beam. A ring of similar panels, the whole group together called "the lens," sends forth a series of level beams absolutely without value with their great intervening dark spaces on the sea till the apparatus is set in motion. Then it at once becomes of the highest known value as a guiding light, showing a series of brilliant flashes alternating with total eclipses. An adaptation of the same principle securing a fixed light allows, also, the combination of both in one.

The famous Scotch light-house engineer, Mr. Alan Stevenson, says of the Fresnel lens: "Nothing can be more beautiful than an entire apparatus for a fixed light of the first order, . . . a central belt of refractors forming a hollow cylinder 6 ft. in diameter and 30 in. high; below it six triangular rings of glass ranged in cylindrical form; and above, a crown of thirteen rings of glass, forming by their union a hollow cage of polished glass 10 ft. high and 6 ft. in diameter. I know of no work of art more beautiful or creditable to the boldness, ardor, intelligence and zeal of the artist."

By means of the combined refracting belt of prisms round the flame and the reflecting prisms closing it over at the top, the lens saves and uses all the light generated by the lamp, however large or however small the entire apparatus may be. No rays stream off uselessly skyward, nor fall to the ground close round the tower. The level wedge of light that makes a flash, and which is as high and as broad as the panel, is projected towards the far horizon, visible as far off as the curvature of the earth will allow, in the case of coast lights, and easily adapted to the range of visibility desirable in lower and smaller lights. But with the revolution of the lens difficulties begin. To set this ponderous, breakable and delicately adjusted structure in rapid motion is the problem now likely to be satisfactorily solved by resting the lens on a quicksilver float. The lens of the common revolving light, standing on a metal plate, is placed on a set of small, steel wheels running on a steel track, and operated by clockwork. One experiment, to reduce friction, and thus quicken the speed, poised the lens on a steel pivot turning in an oil bath on a steel plate. Experiments have also been made with ball bearings, a much less expensive arrangement, and giving satisfaction in lenses of the smaller class. Dispensing entirely with the flash panel lens in some cases, a twinkling or occulting light is produced by a clockwork attachment that drops a metal cylinder over the lamp chimney at short intervals, a characteristic especially valuable in harbor lights of low elevation likely to be confused with house or ship lights.

A distant observer looking at one of the higher order lights along the focal plane may easily conclude that the flame to make so great a light must be as big as a bushel basket, but in point of fact the largest flame in use could be hidden in a quart pot. In the largest lens made, called the Hyperradiant lens, the power of the lamp is one forty-two one-thousandth of the power of the whole light. The layman is, however, always properly astonished at the size and construction of one of these big lamps, with its massive burner of five concentric wicks, and its reputed ability to consume four or five gallons of oil a night. In striking contrast to the first order, fixed lamp, the portable lamp of a lower order looks comfortably domestic. The keeper can take it out of the lens and down into his kitchen to polish and clean, and trim, and fill with its abundant quart of oil for its night's work. But even the fine lamps in use are open to improvement. Col. Heap, who could if he would make an Aladdin's lamp in his wonderful workshop at Staten island, is ever devising something better than the something in use, making magic lamps and attachments, and even magic clockwork to ring up the keeper when his light stops, all going to help to keep the sailor on an even keel.

The electric light, extremely costly and not wholly reliable, is in experimental operation at some of the coast light stations, and on recently built light-ships, and on special chains of buoys. The simple device of opening and closing the circuit secures a flashing light, unreliable, to be sure, but very fine of its kind. Light-ships of the older pattern still carry their old-time ton load of reflector lights at the masthead, built round the mast on a chariot that slides down into its own room at the foot of the mast for safe keeping during the day. The many lamps necessary to make a continuous belt of light, the massive reflectors and the metal framework have, added to their weight, the plate glass lantern 4 ft. high and 8 ft. across which protect the light from wind and water as the ship rides at anchor, and the old-fashioned light-ship can show but five common characteristics. It can have one light or two lights, one or both white or red.

RANGE LIGHTS, POST LIGHTS, ETC.

The broadly visible work of a light-house light may not, however, be all it can do. While it may appear to be sending its whole strength seaward, it is often interestingly busy guarding an adjacent shoal by means of a beam thrown across it from a red panel looking that way, listed with its correct bearings as a "sector." The change of color in the light he sees warns the sailor to open out quickly again the right colored light, which means safety.

Two lights in range may show the safe way, as the treasured old Ipswich beacon does, shifted about in its little house down on the beach as the bar outside shifts, to bring it in the line of safety with the permanent light farther in shore. Another of the ways devised to keep poor Jack in the channel is to blind the light towards a shoal. Losing the light will, of course, signify danger, and finding it again, safety.

Then there are post lights. Indeed the very first light "over the border" is a "lantern suspended from a pole," on the St. Croix river. And there are gas buoys everywhere, that ride at a mooring like little light-ships, showing a light that burns unattended night and day for many weeks. Gas buoys are promptly placed on wrecks and other temporary obstructions, as well as permanently kept at turning points in the channel not easily covered by adjacent light-house or light-ship lights. All these aids are made available for the stranger pilot, and fully explained to the coast pilot who commonly knows them all with his eyes shut, by means of "lists" issued monthly from Washington. Present and proposed aids are herein minutely described and all changes made, or to

be made, recorded carefully. Towers are listed with special reference to their value as daymarks, intended to help the approaching seaman before he is finally taken in charge by the elaborate system of buoys that mark out the channel for him from the mouth of the harbor to the docks. Before the day of tall towers sailors used to steer by the wind mill and the meeting house steeple, and certain big tree landmarks.

NOTHING TO SHOW THROUGH SNOW OR FOG.

Perfect as modern light-house lighting is, nothing has ever been invented that could show unblurred through snow and rain, or show at all in a fog. "God Almighty hain't made nothin' Himself could show thro' fog," an old 'longshoreman said. But failing a light, something can at least shout through a fog and be heard. And for convenience of attendance and supply the various sounding signals are placed at light stations, except at fiercely exposed points among a group of lights, where a mighty fog signal may even have its own station, as at "The Cuckolds," between Monhegan and Seguin. Continuous sound, analogous to the fixed form of light, is not desirable. Intermittent sound more surely catches the ear and strikes best through the roar of wind and surf. A gray fog creeping in, day or night, shutting each "star" into the circle of its own halo, sets in motion instantly the crowd of ever-ready signals. The tenor sirens sing, the trumpets hoot, the whistles shriek and the bells toll solemnly; and the nervous "hand bells," sounded in answer to signals, ring and listen, and ring again. You look away from the clear blue horizon line and the gray rocks and the shining sea between, and look back again at a dead gray wall that crowds over the garden fence and bounds the visible world, and it is hardly done before the fog signal is telling the bigger world where you are.

PROGRESS OF NAVAL CONSTRUCTION.

The monthly summary of the progress of construction of vessels building for the United States navy shows a fair gain for September. There is an appreciable increase in the Denver class of cruisers. The cruiser Cleveland, building at the Bath Iron Works, Bath, Me., is 20 per cent. completed and the Denver at Neafie & Levy's, Philadelphia, is 29 per cent. completed. Work has also begun at Lewis Nixon's ship yard on four of the submarine boats for which contracts were lately let. Following is the summary:

		Degree of completion, Per cent.	
BATTLESHIPS.		Sept. 1.	Oct. 1.
Illinois	Newport News	85	85
Alabama	Cramp & Sons	99	99
Wisconsin	Union Iron Works	96	97
Maine	Cramp & Sons	34	35
Missouri	Newport News	12	15
Ohio	Union Iron Works	28	30
SHEATHED PROTECTED CRUISERS.			
Denver	Neafie & Levy	24	29
Des Moines	Fore River Engine Co	6	7
Chattanooga	Lewis Nixon	8	11
Galveston	Wm. R. Trigg Co	1	2
Tacoma	Union Iron Works	1	3
Cleveland	Bath Iron Works	15	20
MONITORS.			
Arkansas	Newport News	41	42
Connecticut (to be renamed)	Bath Iron Works	65	68
Florida	Lewis Nixon	46	48
Wyoming	Union Iron Works	51	53
TORPEDO BOAT DESTROYERS.			
Bainbridge	Neafie & Levy	73	78
Barry	Neafie & Levy	72	76
Chauncey	Neafie & Levy	72	76
Dale	Wm. R. Trigg Co	82	83
Decatur	Wm. R. Trigg Co	79	81
Hopkins	Harlan & Hollingsworth	67	68
Hull	Harlan & Hollingsworth	67	68
Lawrence	Fore River Engine Co	97	98
Macdonough	Fore River Engine Co	95	96
Paul Jones	Union Iron Works	75	76
Perry	Union Iron Works	75	76
Preble	Union Iron Works	75	76
Stewart	Gas Engine & Power Co	34	37
Truxtun	Maryland Steel Co	31	38
Whipple	Maryland Steel Co	31	38
Worden	Maryland Steel Co	31	38
TORPEDO BOATS.			
Stringham	Harlan & Hollingsworth	98	98
Goldsborough	Wolff & Zwicker	99	99
Bailey	Gas Engine & Power Co	96	97
Bagley	Bath Iron Works	83	92
Barney	Bath Iron Works	96	97
Biddle	Bath Iron Works	65	75
Blakely	Geo. Lawley & Son	92	94
DeLong	Geo. Lawley & Son	92	94
Nicholson	Lewis Nixon	75	80
O'Brien	Lewis Nixon	77	82
Shubrick	Wm. R. Trigg Co	90	92
Stockton	Wm. R. Trigg Co	96	97
Thornton	Wm. R. Trigg Co	88	89
Tingey	Columbian Iron Works	61	61
Wilkes	Gas Engine & Power Co	53	60
SUBMARINE TORPEDO BOATS.			
Plunger	Wm. R. Trigg Co	85	85
Adder	Lewis Nixon		6
Grampus	Union Iron Works		0
Moccasin	Lewis Nixon		6
Pike	Union Iron Works		0
Porpoise	Lewis Nixon		6
Shark	Lewis Nixon		6

According to a return published by the ministry of finance, the Russian mercantile marine on Jan. 1 last numbered 657 steamers, of the estimated value of £9,251,000, and 2,143 sailing vessels, of the value of £1,510,000. Of the steamers, nearly all are of foreign construction (mostly British), but of the sailing vessels a large proportion were built in the Baltic provinces. Of the above-mentioned vessels, 159 steamers and 460 sailing vessels have been added to the mercantile navy within the last three years. Odessa is the chief port of registry in the Black sea. According to the customs returns the number of vessels registered in that port on Jan. 1, 1899, was 265 steamers and 535 sailing vessels, and on Jan. 1, 1900, 282 steamers and 540 sailing vessels.

FRENCH NAVAL CONSTRUCTION FOR 1901.

The French ship building program for the year 1901 has just been issued. The names of no less than 111 vessels are included in this statement, but thirteen of these are to be completed during the present year, including the Iéna, a 12,000-ton battleship, and the submarines Farfadet and Algérien. During the year the battleships Henri IV., 9,000 tons, and Suffren, 12,000 tons, the armored cruisers Jeanne d'Arc and Montcalm, and the first-class cruiser Jurien de la Gravière, will be added to the French navy, as well as the three destroyers Pertuisane, Escopette and Flamberge. Five submarines—the Sirène, Triton, Korrigan, Gnome and Lutin—will also be completed, besides seven sea-going torpedo boats, and twelve smaller boats. The battleship Henri IV. is building at Cherbourg, and is to be finished by April 1; the Suffren, at Brest, is to be ready by May 1. Two new battleships, known at present as the A8 and A10, laid down under the act for the development of the fleet, are to be of a new type. They will have a displacement of 14,865 tons, 14,475 H.P., 18 knots speed and 8,390 miles radius of action when steaming at 10 knots. Their armament will include four heavy guns, 18 guns of medium caliber and twenty-eight smaller pieces, with five torpedo tubes. The estimated cost of each is 35,500,000 francs. These ships, it will be noticed, correspond very nearly to the British Formidable type.

Of armored cruisers France has in all fourteen under construction, divided into five different types. Of these the Jeanne d'Arc, to be completed towards the end of 1901, is the only vessel of her class. She has a displacement of 11,270 tons, and will cost nearly 17,000,000 francs. This vessel, it will be observed, is a little smaller than the English Cressy class, but is to have two knots extra speed, 23 knots, as compared with the 21 knots of the English ships. Three other armored cruisers—the Dupetit Thouars, Gueydon and Montcalm—have a displacement of 9,517 tons. They are being constructed at Toulon, Lorient and La Seyne respectively. The speed of this class is to be 21 knots. After these come five cruisers of 10,014 tons—the Condé, Gloire, La Marseillaise, Sully and Amiral Aube. The two first are building at Lorient, the third at Brest and the other two at Seyne and Saint Nazaire respectively. There are also three armored cruisers of 7,700 tons, specially designed for service in foreign waters. The twelve cruisers above mentioned were laid down before the close of the year 1899. In 1900 two vessels of a new type were commenced, the Jules Ferry and the Léon Gambetta, the former at Cherbourg, and the latter at Brest. They are to be of 12,550 tons displacement, of 27,500 H.P. and 22 knots speed. Lastly, an armored cruiser, known as C13, similar to the Jules Ferry, will be commenced at Toulon during the coming year. With regard to protected cruisers, since it has been decided to discontinue building this type of vessel, there is but one under construction, the Jurien de la Gravière, now building at Lorient. She is to be completed by Oct. 1.

A distinctive feature of the new French program is the entire absence of torpedo boats, either of the seagoing or harbor type, these having been given up in favor of the destroyers, which it is said "can keep the sea better and act more advantageously as scouts." Thus there remain under construction only the seven seagoing torpedo boats previously mentioned, and these will be completed in 1901. On the other hand, the building of destroyers will be pushed on energetically, fourteen being in hand, while ten others are to be laid down. These will be divided between the government and private yards. Much interest naturally centers in the construction of submarines. Altogether seventeen such vessels are provided for. Two of these, as has already been mentioned, are to be completed in 1900. The Triton and Sirène, building at Cherbourg, which were delayed in construction pending the completion of the trials of the Narval, have lately been pushed forward. Two new submarines of the submersible type—the Silure and Espadon—have been commenced at Cherbourg during the current year. During 1901 eight others will be put in hand, six at Toulon and two at Cherbourg. The complete flotilla of submarines, as at present arranged, will therefore consist of twenty-two vessels, of which seven will be completed in 1900, the same number in 1901, five in 1902, and three in 1903.

PESSIMISTIC ON THE SUBJECT OF GUAM.

In his annual report to the secretary of the navy Rear Admiral W. K. Van Reypen, surgeon-general, takes a pessimistic view from the standpoint of health of the use of Guam as a naval station.

"Typhoid fever is practically epidemic among the natives," he says, "owing to the pollution of drinking water in shallow wells near cesspools and to the very common lack of any provision whatever for the receipt of refuse matter. The disease soon appeared among the enlisted force, as access to contaminated water was under the circumstances unavoidable. During less than five months there were twenty-five cases and four deaths from this cause in a force of 143 men. The climate is debilitating. The mean annual temperature is above 77 degrees, but in the winter months, though the days are hot from the larger amount of sunshine, the nights are sufficiently cool for blankets. It is also at this season that the humidity is lessened and the trade winds are most constant. From June to November or December the rainfall is heavy and almost constant, but during the rest of the year the climate is very agreeable for the tropics. Leprosy is not common and the disease is not increasing. There are only fourteen cases known to be on the island at this time. Considering all the circumstances, the conditions are not favorable at this station for continuous good health. Excluding the influence incidental to life in the tropics, the present station is in too close proximity to surroundings made unfavorable by the long occupation of a people unaware of sanitary requirements. It is worthy of note that the health record of the Yosemite, anchored near Cabras island, has been excellent, and it is probable that a naval station established there would enjoy far better health than the one at Agana. As Cabras island is not inhabited, its soil is free from infection. Its natural drainage is excellent and it is reported that there is at hand an ample supply of potable water."

Concerning the health of the large naval force in the Philippines, Admiral Van Reypen says: "Considering the climatic conditions and the necessary exposure, the health of the squadron has been remarkably good. It has been and still is the practice to send officers and men who are suffering from debilitating climatic conditions to the naval hospital at Yokohama, where, as a rule, they soon recover and return to their stations for duty."

SINGLE-CYLINDER CABINET SMOOTHING PLANER.

There is illustrated herewith a machine just placed on the market by the J. A. Fay & Egan Co. of Nos. 325-345 West Front street, Cincinnati, and patented Dec. 19, 1899, Feb. 6, 1900 and May 8, 1900. It is the Fay No. 19 single-cylinder cabinet smoothing planer. Advantages claimed in this machine are:

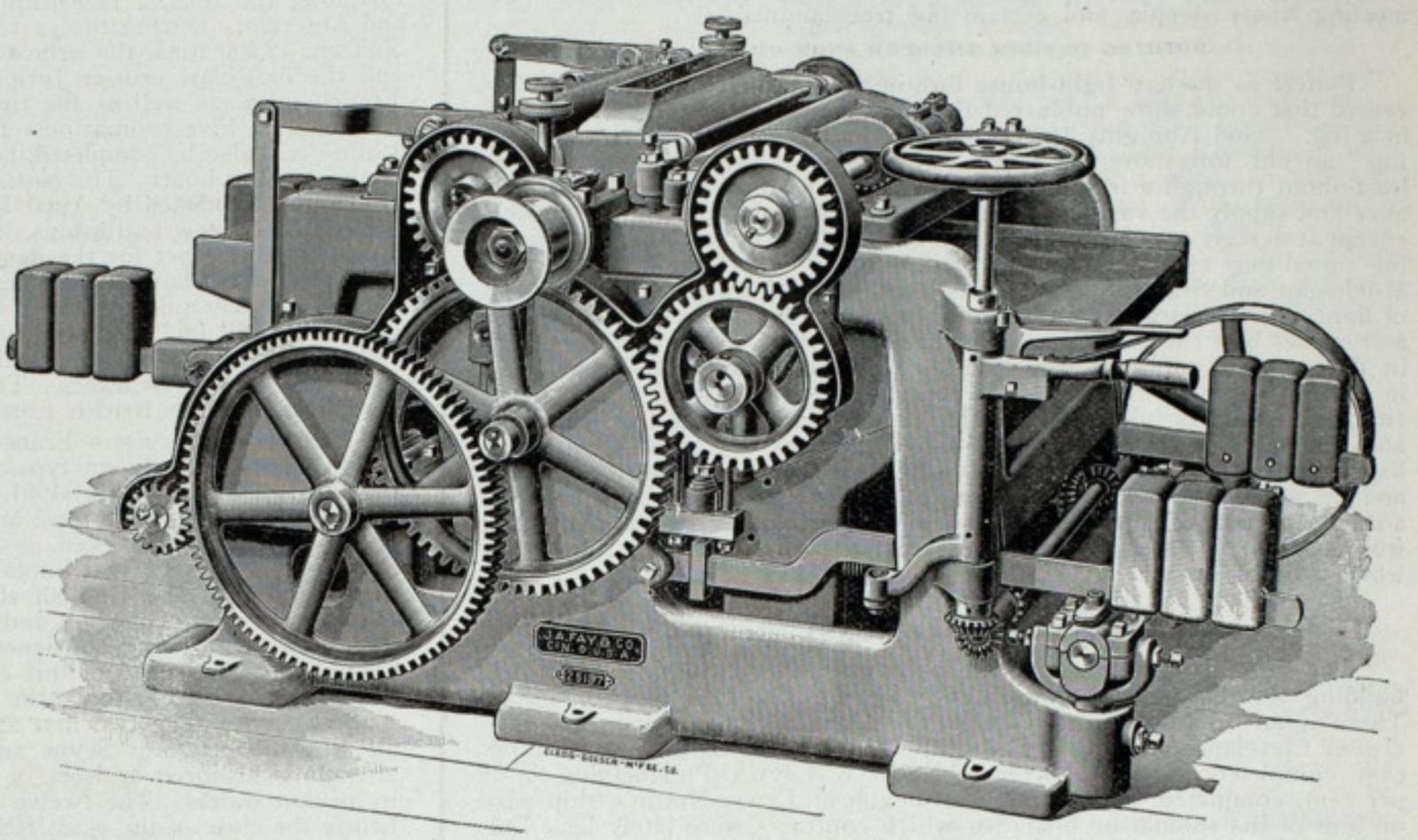
First—The feed rolls are center-geared and hung pivotly.

Second—The pressure for each roll is cushioned on a spring, securing a very fine cut, and enabling the operator to plane smooth without wave.

Third—The bed raises and lowers on long inclines.

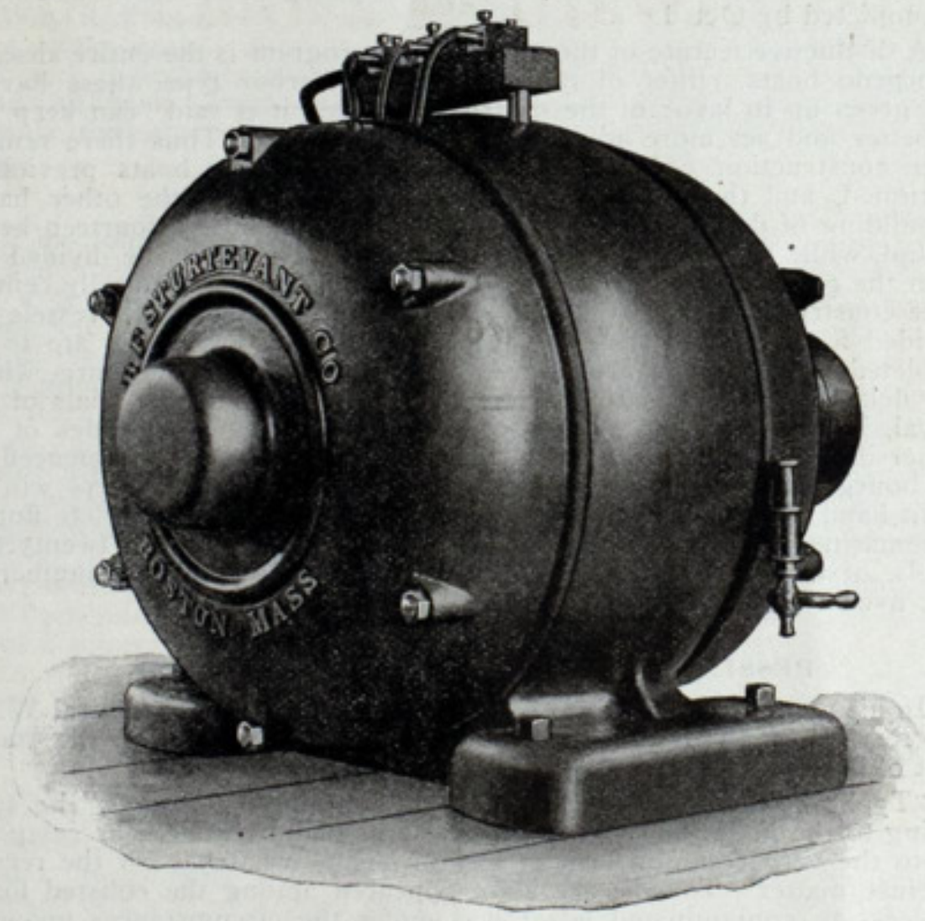
Fourth—The feed is so arranged that with one lever its speed can be increased or reduced, started or stopped, instantly.

The manufacturers will be pleased to furnish any of our readers who may be interested, and will write them, prices and full particulars of this or any other machine for working or cutting wood. and will also forward their new illustrated catalogue free.



ENCLOSED ELECTRIC MOTOR.

This type of motor, built by the B. F. Sturtevant Co., Boston, Mass., being enclosed and readily portable, in the small and medium sizes, is specially adapted for driving small machines, such as machine tools, blowers, etc. For certain classes of work where the conditions are favorable, the motor may be direct-connected to the machine which is to be driven. Cased fans of the centrifugal type may be thus equipped, and if desired the fan-casing itself may be supported by the motor frame and made adjustable about it, so that any direction of air discharged may be provided. In order to avoid the excessive temperature which is incident to the operation of most enclosed motors, this type



has been very carefully designed, so that a low temperature rise can be maintained without greatly increasing the size and weight above that of the ordinary open type.

This machine is capable of continuous operation for ten hours, with a maximum temperature rise not exceeding 60° F. Yokes extending out from the field ring support the armature shaft. The end casings are entirely independent and can be instantly removed to give access to the entire interior. The bearings and brushes can be reached by simply removing the caps in the center of the casings. The brushes are of hard carbon, in holders of a modified reaction type, which allows of easy adjustment when it becomes necessary to reverse the direction of rotation of the motor. The bearings are self-oiling and self-aligning, and fitted with composition sleeves, which are removable from the outer ends of the boxes. These motors are built in this type in seven sizes, ranging from 1/6 to 5 H. P.

President Charles H. Cramp of the Wm. Cramp & Sons Ship & Engine Building Co., received from Vice Admiral Verhovskoy, head of the department of construction and supply of the imperial Russian navy, a cablegram, in reply to a report of the result of the trial of the cruiser Variag, which, translated literally, reads: "Thanks for joyful announcement. Extremely happy that the eminent Cramps' ship yard has displayed to navies of the world a new brilliant success. I heartily desire you may keep your good health a long time yet, for the glory of your works and your name, continuing to hold high your professional traditions."

REFITTED AS A CABLE SHIP.

The transport Burnside, which has been reconstructed and equipped as a cable ship at the Morse Iron Works, Brooklyn, is preparing to sail for the Philippines with 500 miles of cable. The Burnside was selected for this purpose owing to her beam and general roominess. In the last eight weeks she has been completely overhauled and refitted. All of the necessary cable appliances have been installed. Three large cable tanks have been built in the hold, each with a capacity of 250 miles of cable. The government has employed a cable expert to superintend the loading and installing of the cable on the Burnside. The cable will be laid under the supervision of Capt. Squiers of the signal corps. The cost is from $800 to $1,000 a mile. The copper wire of the cable is sheathed with sixteen steel wires covered with jute, and the whole is incased in an outer covering of gutta percha. The cable expert on the Burnside said:

"The laying of a cable in the Philippines or elsewhere entails a good deal more work than the mere steaming from one to the other of the two stations which are to be connected by it. During each step constant tests are taken. Before laying, the intended route is carefully sounded, to discover any irregularities in the sea bottom, which would be injurious to the cable. The sounder is lowered at the end of a long coil of fine pianoforte wire wound on a drum, the heavy shot used for sinking it being automatically released on reaching the bottom so as to facilitate the recovery of the sounder. The number of revolutions of the drum, recorded by an index attached to it, gives the depth to which the sounder has sunk. On reaching the spot where the cable is to be landed, sheaves are fixed on the beach, and a line passing around them and back to the ship hauls the end of the cable, floated by large india-rubber balloons, to the shore. The end is taken into a cable hut furnished with electrical instruments, and during the laying electricians remain in the hut to keep up communication day and night with the ship. In a depth of two thousand fathoms the cable takes about three hours to sink, so that if a ship is paying out at the rate of nine knots an hour, the distance from the vessel to the spot where the cable reaches the bottom is no less than twenty-seven nautical miles."

The Burnside was formerly the Rita, one of the prize steamers taken from Spain in the war. She was captured by the Yale while trying to run the blockade off the east end of Porto Rico. She is armed with seven rapid-fire guns and carries a crew of 104 men, besides a special cable crew of twenty-five. She is to carry a number of army officers and their wives to the Philippines. Fifty-five days will be required for the voyage, by way of the Suez canal, which will include a number of stops in order to test the cable.

BLOWER SYSTEM OF MECHANICAL VENTILATION.

The particular features of the blower system of mechanical ventilation and heating are thus summarized in a recent lecture by Walter B. Snow of the engineering staff of the B. F. Sturtevant Co., Boston:

"The entire heating surface is centrally located, enclosed in a fireproof casing, and placed under the control of a single individual, thereby avoiding the possibility of damage by leakage or freezing incident to a scattered system of steam piping and radiators. The heater itself is adapted for the use of either live or exhaust steam, and provision is made for utilizing the exhaust of the fan engine, thereby reducing the cost of operation to practically nothing. At all times ample and positive ventilation may be provided with air tempered to the desired degree. Absolute control may be had over the quality and quantity of air supplied. It may be filtered and cleansed, heated or cooled, dried or moistened at will. By means of the hot and cold system, the temperature of the air admitted to any given apartment may be instantly and radically changed without the employment of supplementary heating surface. The pressure created within the building is sufficient to cause all leakage to be outward, preventing cold inward drafts and avoiding the possibility of drawing air from any polluting source within the building itself. By returning the air, using live steam in the heater and operating the fan at maximum speed, a building may be heated up with great rapidity, as is usually desirable in the morning. The area of heating surface is only one-third to one-fifth that required with direct radiation, while the primary cost and operating expense of a fan is far less than that of any other device for moving the same amount of air."

TRADE NOTES.

The International Storage Battery Co., 45 Milk street, Boston, have issued a tasty little catalogue on the subject of storage batteries. The company claims the rights to manufacture the lightest, the most durable, the most efficient and the most compact storage battery ever made.

The British Linde Refrigerating Co., which established a branch office in Montreal a few years ago, has recently opened an office in New York (45 Broadway), where they will do business as the American Linde Refrigerating Co. The Linde system is one of the oldest and best methods of refrigerating, and 500 plants are already in successful operation on board ships.

Bethlehem forgings have again scored in the remarkable results attained in the trial trips of the United States battleship Wisconsin and the Russian cruiser Variag. The Wisconsin's shafts were forged from fluid-compressed nickel steel, and those for the Variag from fluid-compressed carbon steel, all being shaped under the hydraulic press, carefully annealed, and finished according to standard practice at the Bethlehem works. The Bethlehem company has just cause for pride in the performances of both ships.

The new twenty story office building which is being erected at the corner of Broad and Exchange place, New York city, and which will be known as the Broad & Exchange, will be equipped throughout with the Kenney flushometer, manufactured solely by The Kenney Co., New York, which system has been adopted on account of its superiority as a fitting sanitary device for this largest of all office buildings ever erected. The general contractors are the Geo. A. Fuller Co. of New York and Chicago, and the plumbing will be done by Mr. T. J. Byrne of New York.

Black and gold are the colors in which the Paris exposition edition of the catalogue of the Chicago Pneumatic Tool Co. is bound. This company, manufactures of pneumatic labor saving appliances of all kinds in use in all the principal ship yards and manufacturing plants, received the highest award and only gold medal conferred on pneumatic tools at the exposition. The catalogue is illustrated with fine views of the company's exhibit at the exposition. It also contains a number of half tones from photographs, showing the various uses to which pneumatic tools are today put. This embraces steel structural work, boiler work, ship work, marble work, railway work and nearly every form of iron work.

The 1900 catalogue of the Standard Chain Co., Pittsburg, Pa., is most exhaustive. It consists of 92 pages and is profusely illustrated throughout. Special reference is made in the catalogue to the dredge chain, which is the best chain made. The iron used is refined and re-rolled. It is tough and fibrous and made hard to prevent wearing rapidly. The iron will stand a tensile strain of 54,500 lbs. to the square in., and the welding of it is entrusted only to the most experienced workmen. The chain is especially recommended for use on dredges, steam shovels, cranes and wrecking cars. The Standard Chain Co. has its own rolling mill and is enabled therefore to roll just such grades of iron as are required to make the very best chain. Every chain is submitted to a severe test; and no chain indeed is absolutely safe until it has been tested. Their towing chains have special merit.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of October 17, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	33½	34¼	33¼	33⅜
American Steel & Wire, Pfd.....	74¾	74¾	74¼	74¼
Federal Steel	34¾	35¼	34¼	34⅝
Federal Steel, Pfd.....	65	.....	.....	65
National Steel	27½	27½	26½	27
National Steel, Pfd.....	85	.....	.....	85
American Tin Plate	32⅛	32½	32	32½
American Tin Plate, Pfd.....	82¾	.....	.....	82¾
American Steel Hoop.....	20⅜	20⅜	19⅝	19⅝
American Steel Hoop, Pfd.....	66⅝	66⅝	66½	66½
Republic Iron & Steel	12	12	11⅞	12
Republic Iron & Steel, Pfd	53½	53¾	52¾	53¾

WANTED.

Wanted immediately two competent hull draftsmen. State qualifications and expectations. Detroit Ship Building Co., Detroit, Mich.

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(Only Gold Medals in this Class)

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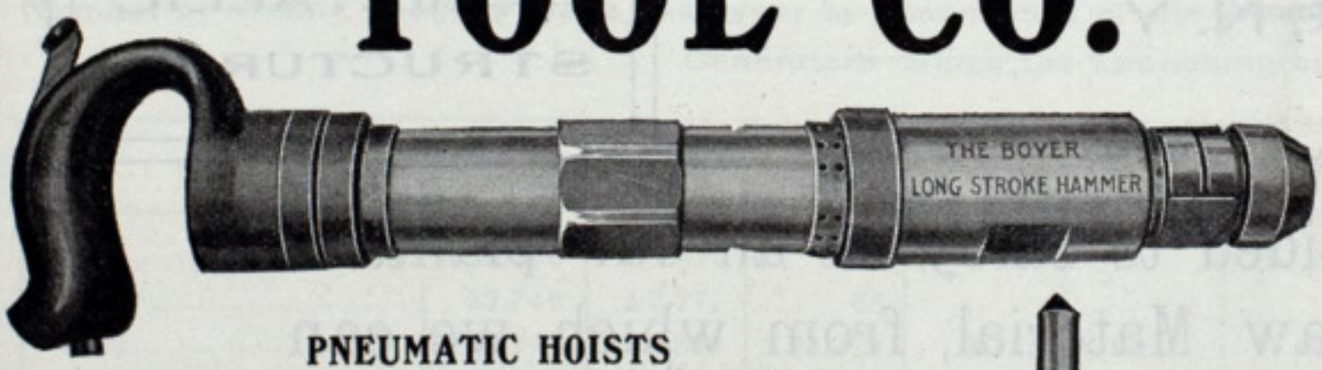
for Chipping
" Calking
" Riveting
" Beading
" Stone cutting, etc.

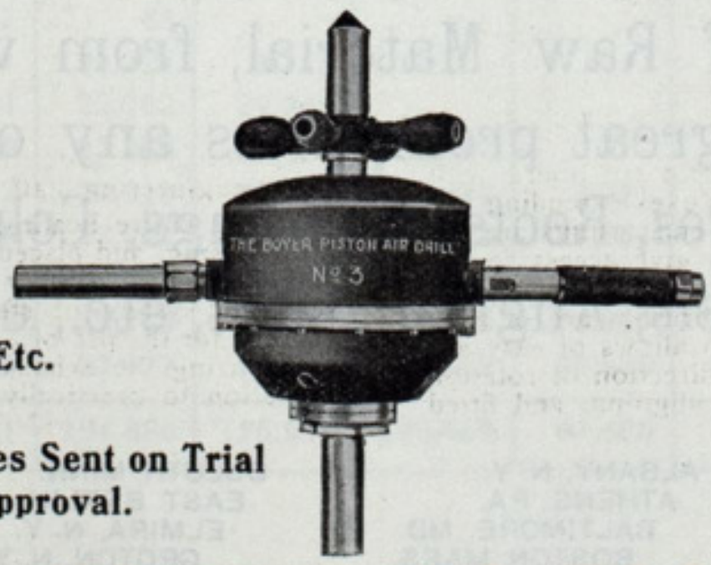
RIVETERS
for Shipyard use
" Boiler work
" Bridge work
" Structural work



DRILLS
for Railroads
" Mines
" Quarries
" Foundries
" Machine Shops
" Wood boring

FLUE { Welders, Expanders, Reducers, Rollers, Cutters

PNEUMATIC HOISTS
CRANES
JACKS (Car and Locomotive)
PAINTING MACHINES
MOTORS for every use
CASTING CLEANERS, Etc.



Pneumatic Appliances Sent on Trial Subject to Approval.

By actual statistics 95% of all Pneumatic Tools sold all over the world are our tools.

UNITED STATES COMMISSION
TO THE
PARIS EXPOSITION OF 1900

PARIS 20 AVENUE RAPP — CHICAGO AUDITORIUM BUILDING — NEW-YORK EQUITABLE BUILDING

PARIS OFFICES,
August 21, 1900.

Chicago Pneumatic Tool Company,
Chicago.

Gentlemen:

Officially I desire to inform you that your pneumatic tools received at the hands of the International Jury of Award, a Gold medal. Also that Mr. Boyer was awarded a Gold Medal as collaborator and inventor of the tools.

Yours very truly,
F E Drake
Director of Machinery & Electricity.

New York Office: 95 LIBERTY ST.

CHICAGO PNEUMATIC TOOL CO.

GENERAL OFFICES: **Monadnock Block, Chicago.**

Branch Offices: 418 Exchange Building, Boston, Mass. · 1016 Carnegie Building, Pittsburg, Pa. · 241 The Arcade, Cleveland, Ohio. · 421 Market Street, San Francisco, Cal. · Binz Building, Houston, Texas. · 605 Fidelity Building, Philadelphia, Pa. · 316 Lincoln Trust Building, St. Louis, Mo. · 416 Hammond Building, Detroit, Mich.

Foreign Representatives: THE NEW TAITE-HOWARD PNEUMATIC TOOL CO., Ltd., Gen. Europ'n Agt's, 63 Queen Victoria St., London, E. C. · JOHN MACDONALD & SON, No. 9 York St., Glasgow. · SCHUCHARDT & SCHUTTE, Spandauer-Strasse 59-61, Berlin, Germany; Brussels, Belgium; St. Petersburg, Russia; Vienna, Austria; Stockholm, Sweden. · H. GLAENZER & PERREAUD, 1 Avenue De La Republique, Paris, France; and Spain. · H. W. PEABODY & Co., Sydney, New South Wales.

CHICAGO NAUTICAL SCHOOL.

In an unpretending way, Lieut. W. J. Wilson, nautical expert in the Chicago branch hydrographic office, organized, a few years ago, a small class for the study of navigation. There was then little thought of the present movement towards the construction of a large number of vessels on the great lakes for Atlantic coast service. Lieut. Wilson's nautical school was not looked upon with great favor by the older men in charge of lake vessels. But the Chicago nautical expert, who had some spare

time from regular duties, was possessed of a great deal of energy and was determined that his spare time should not be lost. He gradually succeeded in interesting the younger men whom he was meeting from day to day. Now these young men are thankful for the disposition to a general study of the science of navigation prompted by their modest beginning at the Chicago school. The day is at hand when men are wanted who are capable of sailing vessels on salt water as well as on the lakes. Geo. L. McCurdy of Chicago, who represents large insurance interests, encouraged the school by prizes for graduates. The school has prospered, and Lieut. Wilson is certainly entitled to great credit for his efforts. An illustration, made from a photograph of a group of students, is presented herewith.

IMPROVING THE PAY OF BRITISH NAVAL ENGINEERS.

The British admiralty scheme for improving the pay and position of naval engineer officers, a forecast of which was contained in the first lord's memorandum on the introduction of the navy estimates, has been promulgated. The rank of staff engineer is to be abolished, but all officers now bearing that designation are to retain it until promotion to fleet engineer. The rank of fleet engineer is to be granted to officers now serving upon the attainment of eight years' seniority as chief engineer or as staff and chief engineer combined; but in the case of officers entered after April 1, 1900, promotion to fleet engineer is to be contingent not alone upon qualification by seniority, but upon the recommendation of the engineer-in-chief, and upon admiralty approval. Engineers are to rank with lieutenants of less than eight years' seniority. The active list of engineer officers is to consist of an engineer-in-chief, twenty inspectors and chief inspectors of machinery, 313 fleet and chief engineers, 624 engineers and assistant engineers, and 100 artificer engineers. Inspectors and chief inspectors of machinery will continue to draw the same pay as at present, but a new scale has been fixed for chief and fleet engineers, who will begin at 16s. and rise to 30s. a day after fourteen years' service in the higher rank. Engineers will begin at 10s. and rise to 12s. a day after eight years' service in that rank. The pay and status of assistant engineers remain as at present. In future, a chief engineer of eight years' seniority who has been passed over for promotion to fleet engineer will not be allowed to receive full pay in excess of 22s. a day. The half pay of such officers is not to exceed 14s. a day, and they are to be optionally retired at the age of forty-five, with compulsory retirement at fifty. Charge pay will be allowed at rates varying at the discretion of the admiralty from 1s. to 5s. a day. Half charge pay is abolished in the fleet and dockyard reserve, and a fixed allowance of 1s. a day substituted. In ships of upwards of 3,000 I.H.P., the senior engineer under the chief will receive an allowance varying from 1s. to 2s. 6d. a day.

Agents of the New York & Orinoco Iron Co. were at Philadelphia recently to secure vessels to be used in carrying ore from mines at Imataca to Philadelphia. It is reported that the ore is admitted by experts to be the best known on this continent, the only thing that prevents the development of the mines being the shoal water of the Orinoco river. Only light draught vessels are able to ascend the stream. It is thought, however, that boats suitable for the trade can be chartered. Should this attempt not prove successful, barges will be used, towed by steamers. This will be the first attempt on the Atlantic to tow barges on a voyage covering several thousand miles.

The Dominion Dry Dock & Marine Construction Co. has filed articles of association at the office of the secretary of state at Concord, N. H. The capital stock is $500,000, and the incorporators are J. W. Whitney Beals, Jr., of Boston, John A. Andrews of Newton, William J. Wilson and William J. Donovan of Cambridge, and James W. Longstreet of Boston.

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COLUMBUS, OHIO.
DENVER, COLO.
DULUTH, MINN.
EAST BERLIN, CONN.
ELMIRA, N. Y.
GROTON, N. Y.
HORSEHEADS, N. Y.
LAFAYETTE, IND.
LONDON, ENG.
MILWAUKEE, WIS.
MINNEAPOLIS, MINN.
NEW ORLEANS, LA.
PENCOYD, PA.
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YOUNGSTOWN, O.

AMERICAN CABLES FOR THE PHILIPPINES.

None but those who have occasion to watch closely such developments are aware of the scope and importance of recent land line and cable work in the Philippines, under American rule. Lieut. Col. James Allen, chief signal officer in the Philippines, in submitting his report of the operations of the United States signal corps, states that he has under him 350 men available for duty and 3,000 miles of telegraph lines and cables. During one month 208,085 messages were sent and received on the island of Luzon, besides a large amount of business transacted exclusively by telephone. The most notable feature lately is the increased amount of line cutting, which kept many men employed in repair work. On the island of Panay communication in the eastern portion of the island has been abandoned, but it is expected the line will be rebuilt. Twenty miles on the west coast have been destroyed. On Leyte much of the wire put up has been torn down. Many encounters with the insurgents resulted seriously and linemen are often picked off by Filipinos.

It is in view of these conditions and others now arising that the United States government has determined to carry out a most extensive system of telegraphic and telephonic communication, bringing every important point in the group into immediate touch. This work was planned originally in connection with the steamer Hooker, which, carrying out a large consignment of wire and cable, was wrecked off Corregidor island. One result of the unfortunate delay was that larger plans were adopted, and last week the United States cable steamer Burnside sailed from New York for Manila, via Suez canal, with some 600 miles of cable on board. The Burnside has not been temporarily adapted to her purposes, but has been so thoroughly transformed for her new uses that she will practically never be fit for any other service. She has three tanks full of cable, and at Manila the steamer Romulus will deliver to her all the cable-laying machinery which she does not take out herself. The expedition is headed by Capt. G. O. Squier, United States signal service, who has come forward quite prominently of late in cable work and invention, and has recently been on special detail as to the Pacific cable. With him are Mr. Henry Winter, as cable engineer, and Mr. F. A. Hamilton as electrician. The inspection of the cable was conducted most carefully by Capt. S. Reber, U. S. A., Dr. A. E. Kennelly and Mr. Townsend Wolcott, on behalf of the government, at the respective factories The expedition is the most important engaged in by our government, and in well-informed circles is regarded not only as an imperative measure for the maintenance of quiet and order in the Philippines, but as a first step in the American Pacific cable work between the Pacific slope and Asia.

The deep sea cable taken consists of a conductor of seven No. 24 B. & S. wires of 98 per cent. conductivity, with an insulating layer of pure para 1-64 in., and a layer of compound not less than 40 per cent. para, bringing the diameter up to 8-32 in.; then a layer of best rubber cloth tape, double lap. This core is served with two layers of best Calcutta tarred jute, in reverse directions, and an armor of sixteen No. 12 B. & S. galvanized steel wire with not more than 10-in. lay. The outside finish is hot asphalt compound, a layer of Calcutta jute, hot asphalt, another jute layer in reverse, and hot asphalt.

The shore ends are the same as the deep sea, except for additional armor over the first of sixteen No. 6 B. & S. galvanized steel wire, with the same outside finish. The core insulation was tested with 5,000 volts alternating current for five minutes, submerged in water. The finished cable was tested with 1,000 volts alternating for one minute between the core and the armor. After 24 hours' immersion the insulation had to measure at least 1,000 megohms per mile at 60 degrees Fahrenheit. The copper resistance at 60 degrees Fahrenheit was not to exceed 18.63 ohms per mile.

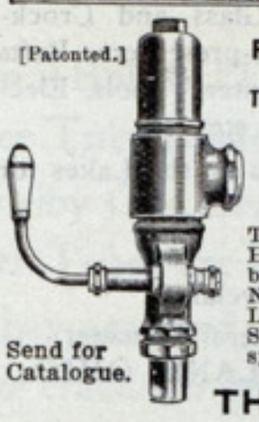
The steamer when she left had a complete testing room in a separate deck house, fully equipped, with the piping for cable ready, and with all necessary supplies and stores for laying and repair. The expedition carried also several sets of wireless telegraph apparatus of the type specially designed by the United States signal corps.

Capt. Manuel Azeta, commander of the Mexican navy, passed through New Orleans last week on his way home. He stopped there to examine the Mexican gunboat under construction at the Johnson Iron Works. Capt. Azeta has been visiting the ship yards at Philadelphia, the navy yard at Brooklyn and the naval academy at Annapolis with the object in view of raising the Mexican navy to a higher standard. The improvement will be mainly in the line of harbor defence, as Mexico cannot afford and does not want a navy for offensive purposes and has no colonial possessions. What Mexico most needs, in the opinion of Capt. Azeta and of President Diaz also, is submarine torpedo boats of the Holland type, a number of which will probably be ordered. Capt. Azeta says that the American naval officers did all in their power to furnish him with information as to the questions he was asked to investigate.

THE FLUSHOMETER THE KENNEY SYSTEM.

FOR FLUSHING WATER-CLOSETS.

[Patented.]



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Owners and Constructors of Steamships, Yachts and Steamboats have found it indispensable.

Showing application of Flushometer.

Used by the U. S. War and Navy Departments—Transports Grant, Sheridan, Burnside, Terry, Logan, Hooker, Thomas, Sherman and others. Also Albany Day Line Steamers, Norfolk & Washington S. S. Line, Steam Yachts Neaira, Aphrodite and Loando, and new Lake Steamers Illinois, Pennsylvania, Angeline, etc.

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Grand Prix 1889 Hors Concours 1900
Originated 1840 Latest Improvements 1896

Number of Marine Leagues made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since the Launching of each Ship.

Year.	Australian	Polynesien	Armand Behic	Ville de la Ciotat	Ernest Simons	Chili	Cordillere	Laos	Indus	Tonkin	Annam
1890	22,576	820									
1891	22,749	22,777	68								
1892	22,749	22,801	23,274	7,753							
1893	22,793	22,781	22,762	22,749							
1894	22,813	22,789	22,858	22,813	12,567						
1895	22,891	22,922	22,913	22,936	13,629	3,571					
1896	23,178	30,906	23,232	23,183	20,735	21.051	13,572				
1897	22,750	23,202	30,912	23.185	20,745	25,370	21,119	14,382			
1898	23,646	23,178	23,184	23,199	20,842	21,080	21,080	20,851	21,318	7,569	
1899	23,178	23,205	22,477	30,135	20,082	20,926	20,956	17,448	18,285	14,669	7,628
Total	229,323	215,381	191,680	175,953	108,600	97,998	76,727	52,681	39,603	22,238	7,628

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10 YEARS EXPERIENCE.
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Government Work a Specialty.

Quality: Highest Standard. Finish: Unexcelled.

CLEVELAND, O., U. S. A.

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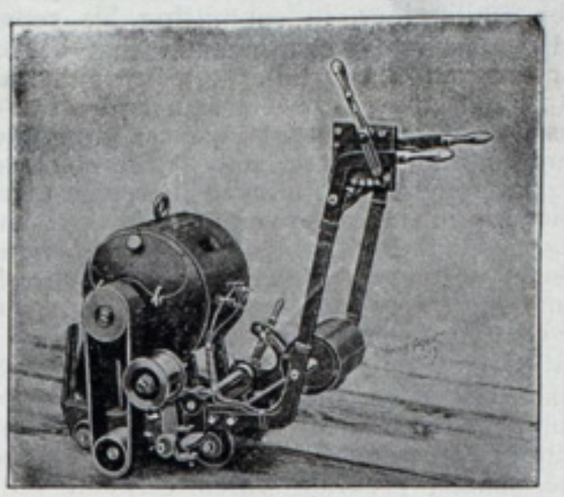

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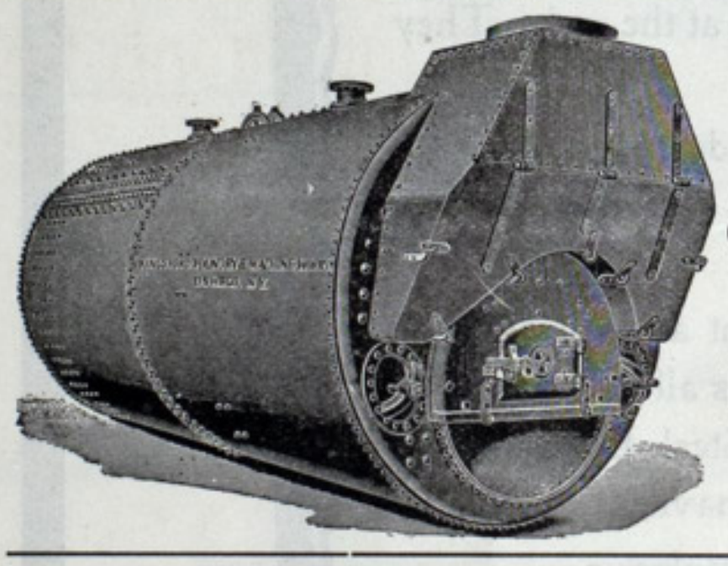

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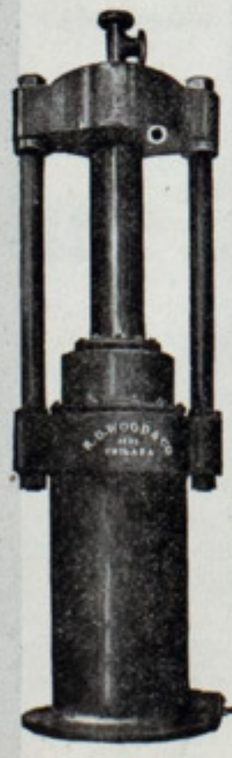

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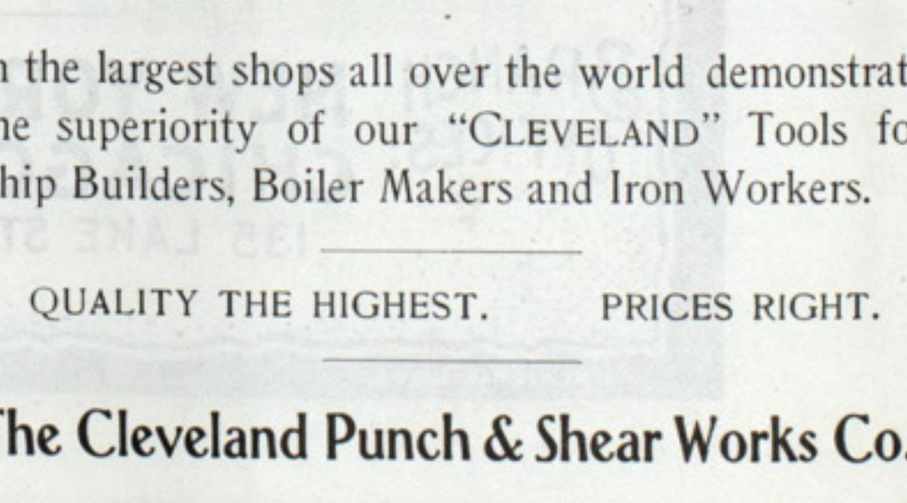

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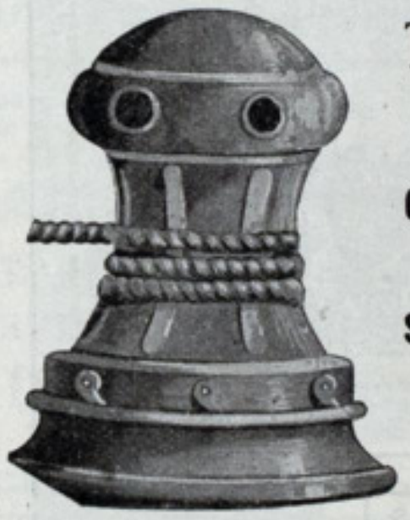

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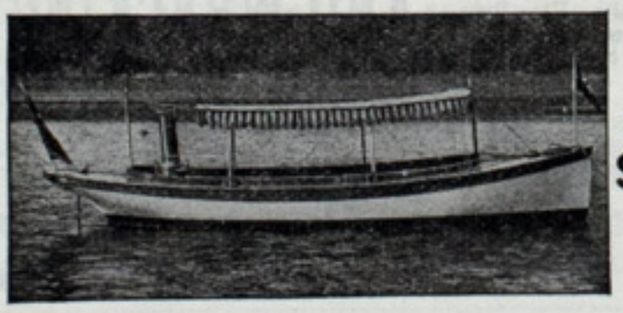

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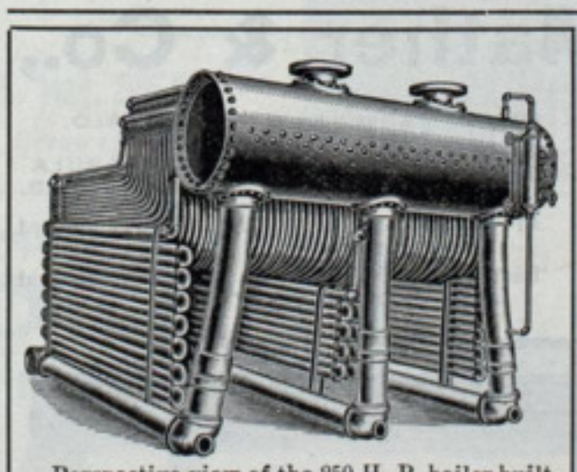

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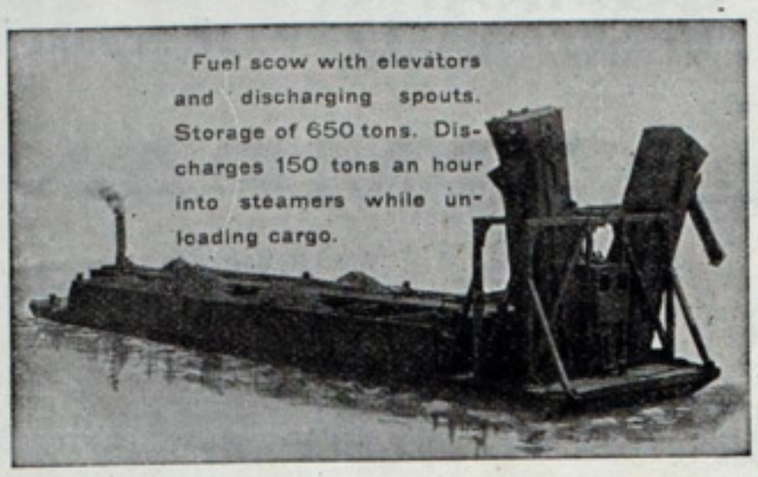
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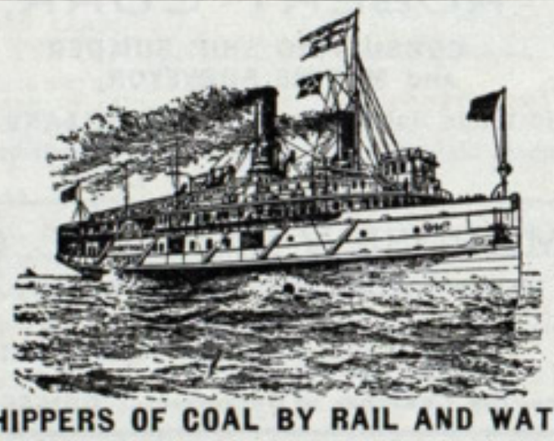

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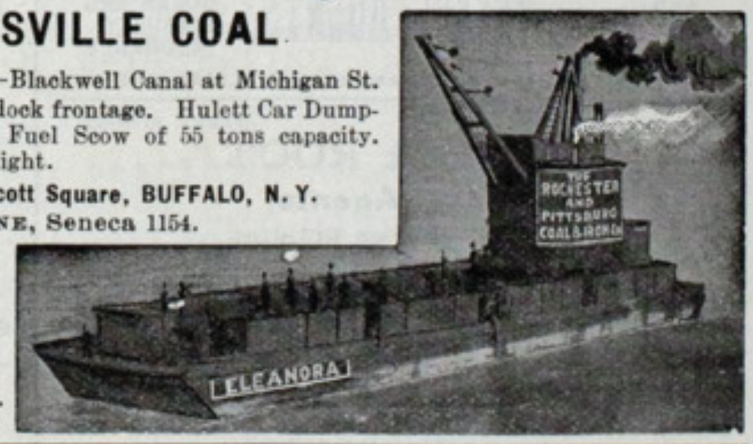

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IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
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Niles Tool Works Co.....Hamilton, O.

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Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

LUBRICATING PUMPS.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A..... .....So. Boston.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co..... .....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Kingsford Foundry & Machine Works..... .....Oswego, N. Y.
Wood & Co., R. D.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.
American School of Correspondence.....Boston.
Chicago Nautical School .....Chicago.
International Correspondence Schools.....Scranton, Pa.

SCREW MACHINES.
Niles Tool Works Co.....Hamilton, O.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co .Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co..... .....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co..... .....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co. .....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.

American Bridge Co.....New York.

SURVEYORS, MARINE.

Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THERMOMETERS FOR MECHANICAL PURPOSES.

Helios-Upton Co.....Peabody, Mass.

TIMBER—LARGE PIECES.

Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.

Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

TOWING COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.

Shelby Steel Tube Co.....Cleveland.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.

Smith, Edward & Co.....New York.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.

Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
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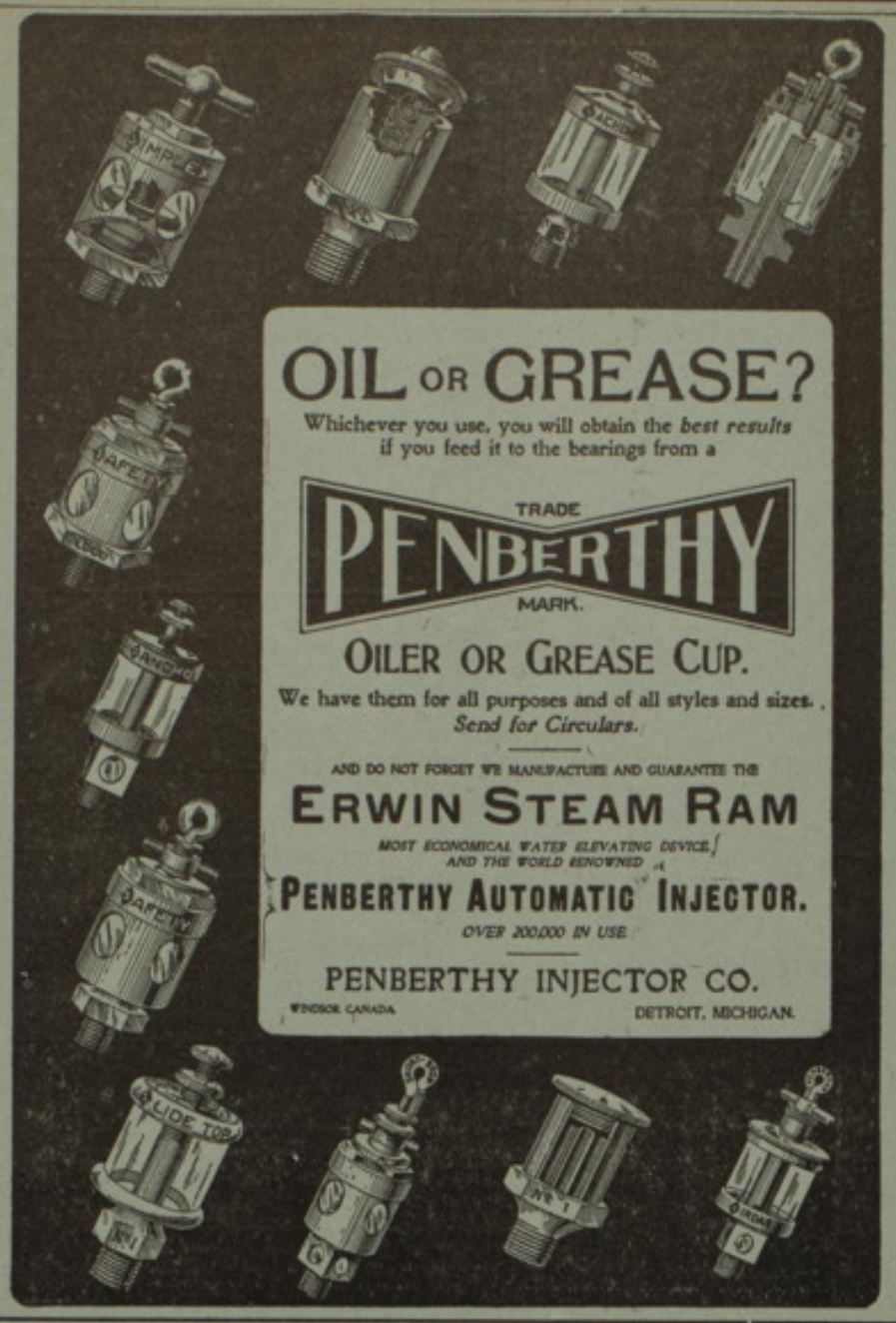

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CLEVELAND CITY TICKET OFFICE,
237 SUPERIOR STREET.

Eastward:—	Ar. fr. West.	Dep. East.
No. 18, Southwestern Limited	.....	*1 55 am
No. 22, Lake Shore Limited	*2 15 am	*2 20 am
No. 28, New York & Boston Express	*7 40 am	*8 00 am
No. 32, Fast Mail	*11 25 am	*11 30 am
No. 44, Accommodation, via Sandusky	†1 25 pm	.....
No. 46, Southwestern Express	.....	*3 00 pm
No. 6, Limited Fast Mail	*5 40 pm	*5 45 pm
No. 10, Chicago, New York & Boston Special	*7 35 pm	*7 40 pm
No. 16, New England Express	*10 30 pm	*10 35 pm
No. 2, Day Express	†9 05 pm	†9 20 pm
No. 126, Norwalk Accommodation	†7 55 am	.....
No. 40, Toledo & Buffalo Accom., via Norwalk.	†10 00 am	†10 30 am
No. 126, Norwalk Accommodation	†7 55 am	.....
No. 116, Conneaut Accommodation	.....	†4 30 pm

Westward:—	Ar. fr. East.	Dep. West.
No. 11, Southwestern Limited	*3 25 am	.....
No. 15, New York, Boston & Chicago Special	*3 05 am	*3 10 am
No. 21, New York & Chicago Express	*5 10 am	*5 20 am
No. 7, Day Express	.....	†6 30 am
No. 19, The Lake Shore Limited	*7 35 am	*7 40 am
No. 23, Western Express	*11 10 am	*11 15 am
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No. 133, Cleveland & Detroit Express	.....	*12 30 pm
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No. 141, Sandusky Accommodation	.....	†3 10 pm
No. 127, Norwalk Accommodation	.....	†5 10 pm
No. 37, Pacific Express	*6 35 pm	*7 00 pm
No. 3, Fast Mail Limited	*10 50 pm	*10 55 pm

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D. JAY COLLVER, C. P. & T. A. 116 Euclid Ave. CLEVELAND.

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WRITE THE UNDERSIGNED FOR ILLUSTRATED PUBLICATIONS.

E. C. OVIATT, Trav. Pass. Agent, 76 Ottawa St., GRAND RAPIDS, MICH.
G. A. CLIFFORD, Trav. Pass. Agent, CINCINNATI, OHIO.
A. E EDMONDS, City Pass. Agent, DETROIT, MICH.
F. W. SALSBURY, Commercial Agent, PITTSBURG, PA.
J. F. LEE, Gen'l Agt. Pass. Dept., 228 So. Clark St., CHICAGO, ILL.
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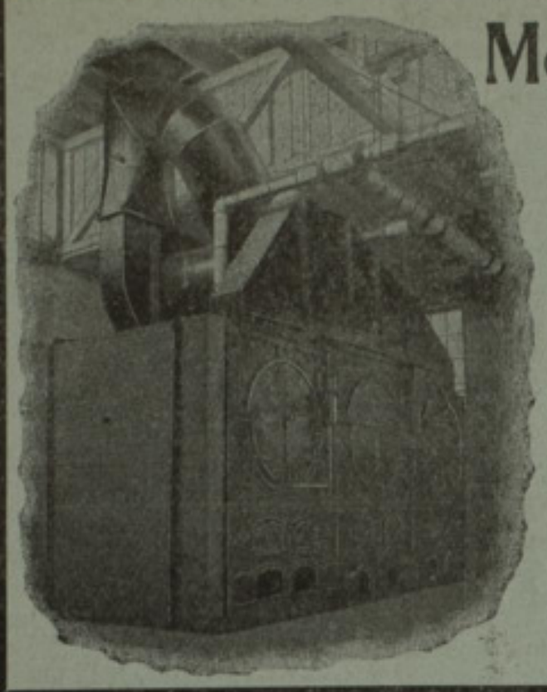

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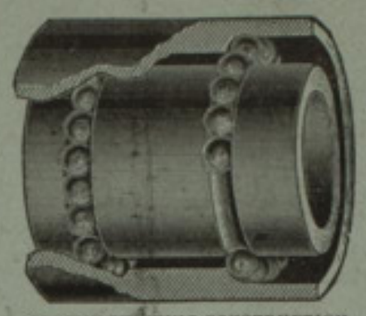

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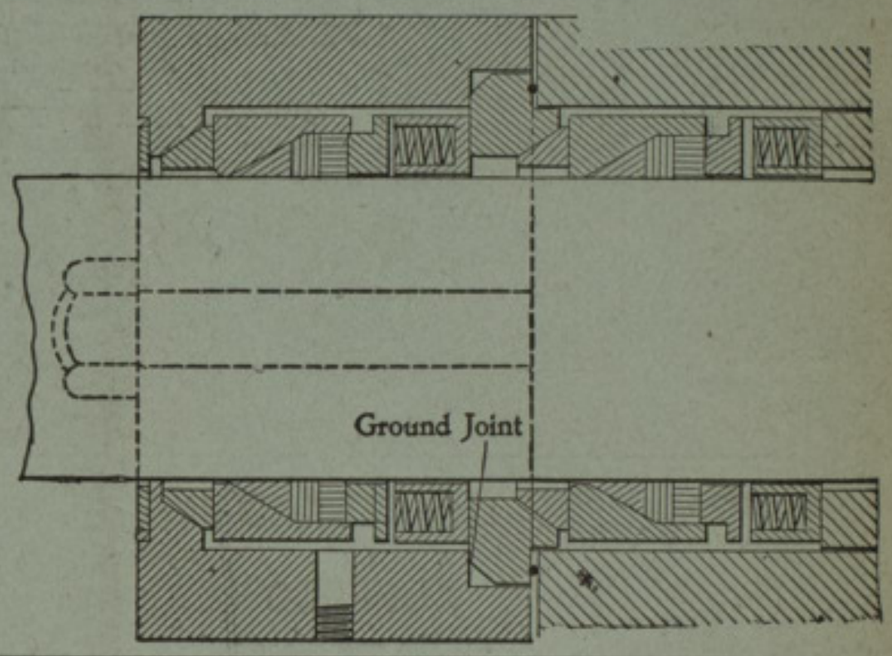

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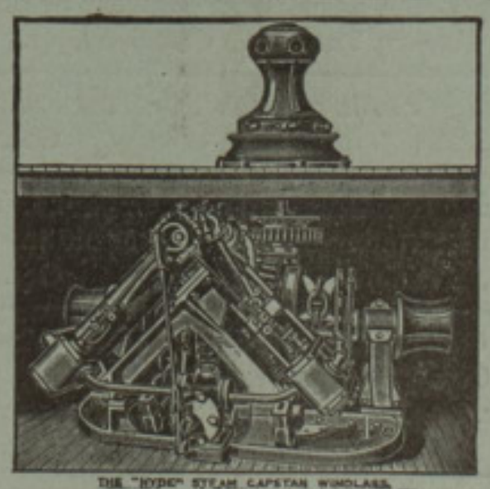

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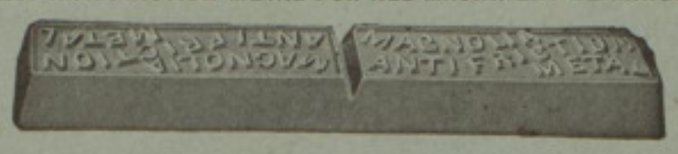

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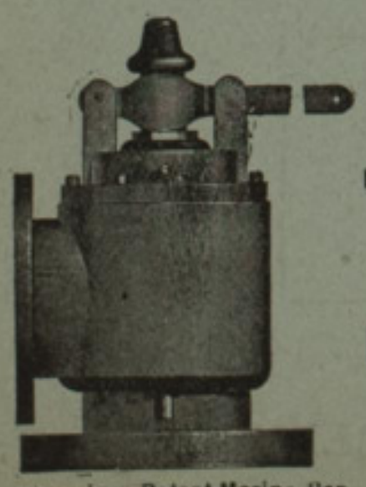

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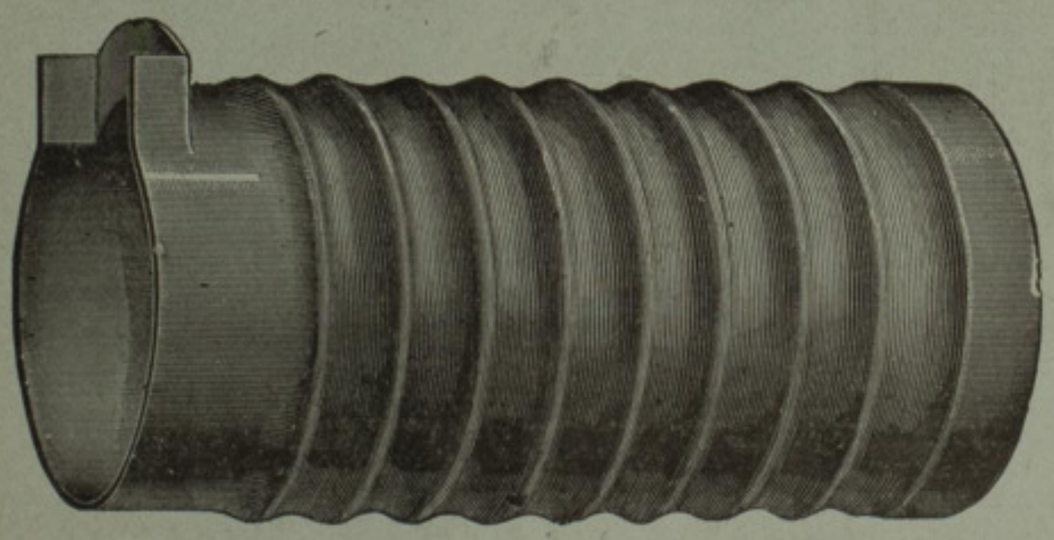

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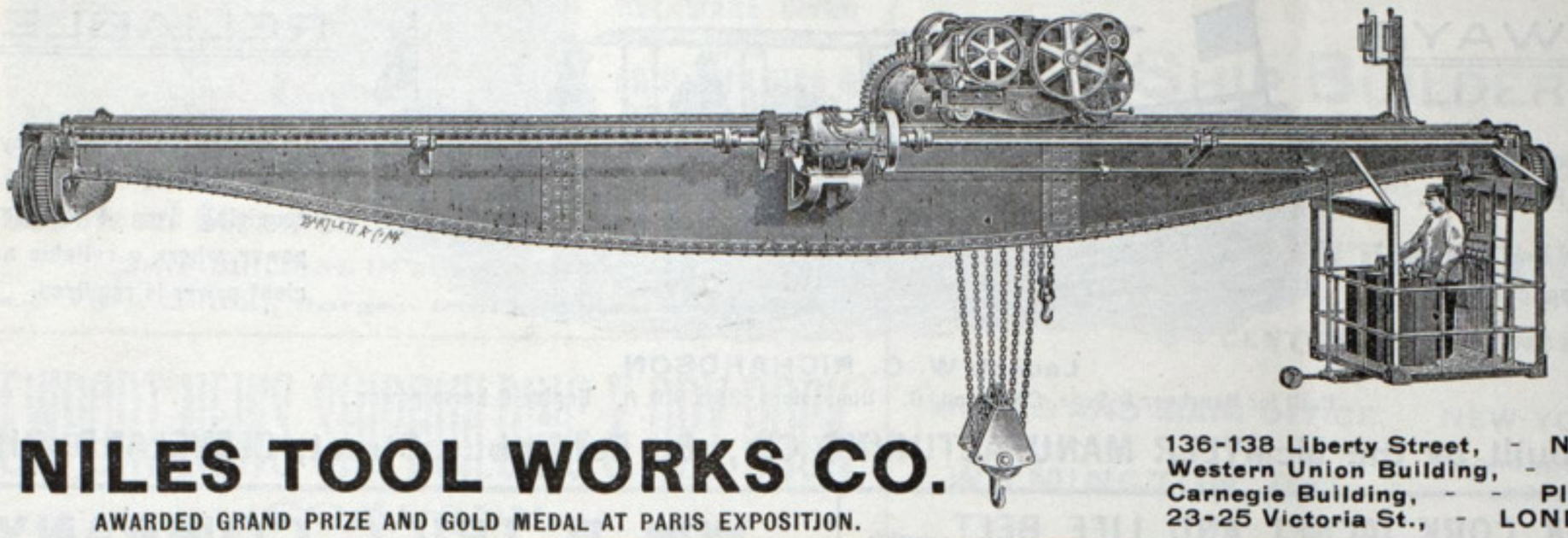

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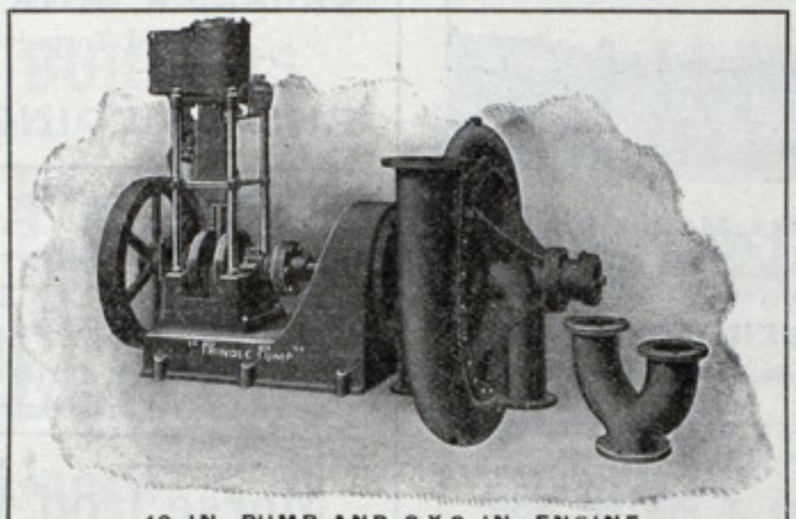

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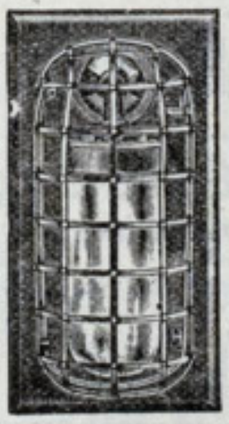

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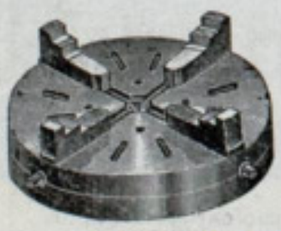

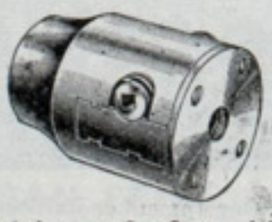

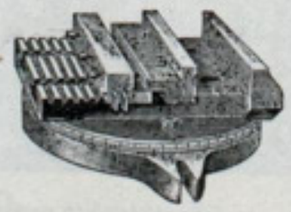

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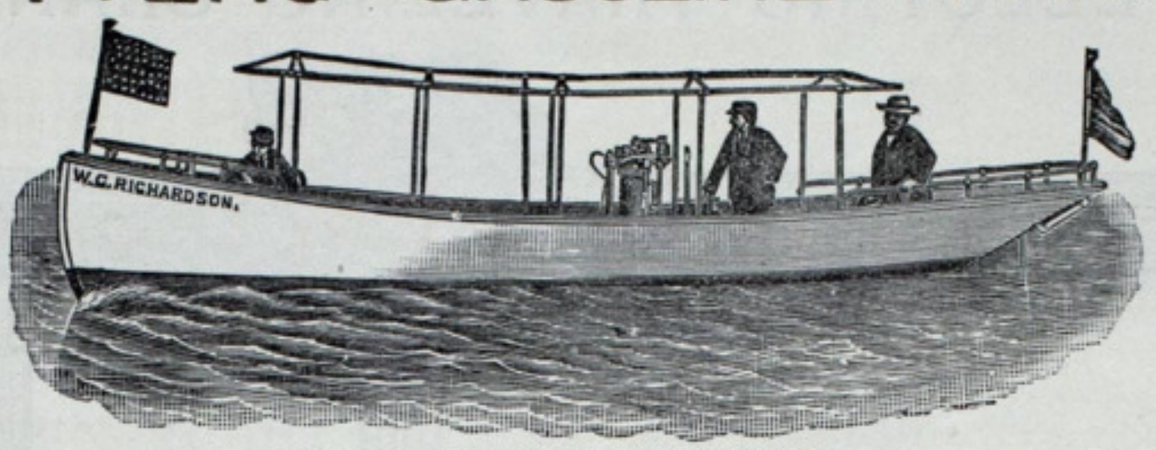

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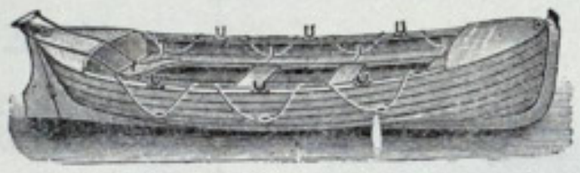

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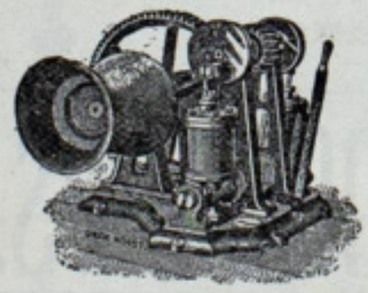

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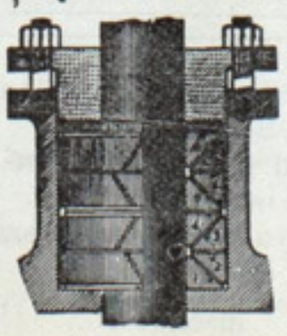

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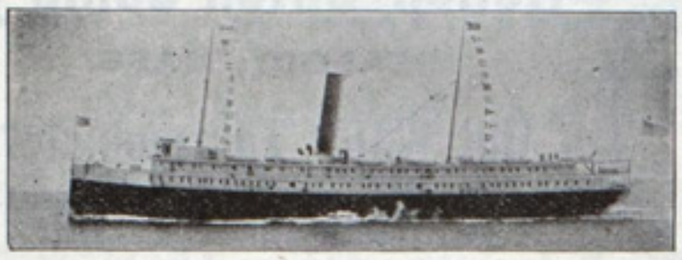

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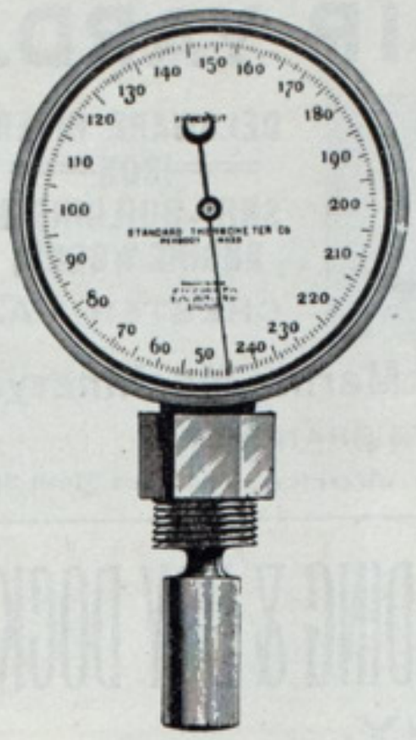

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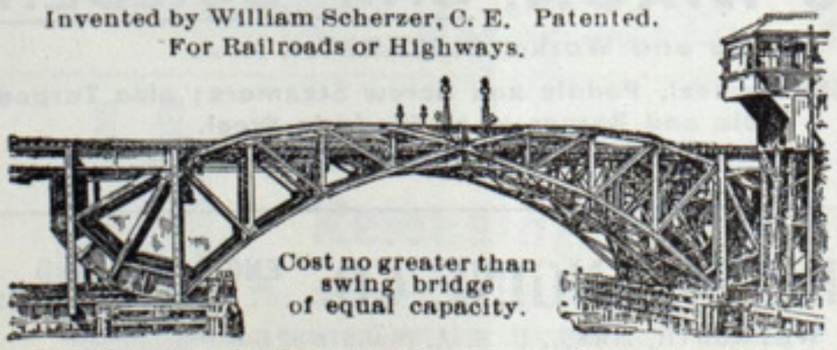

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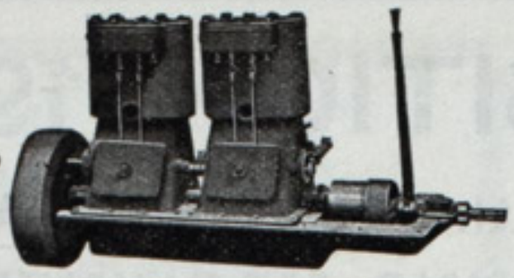

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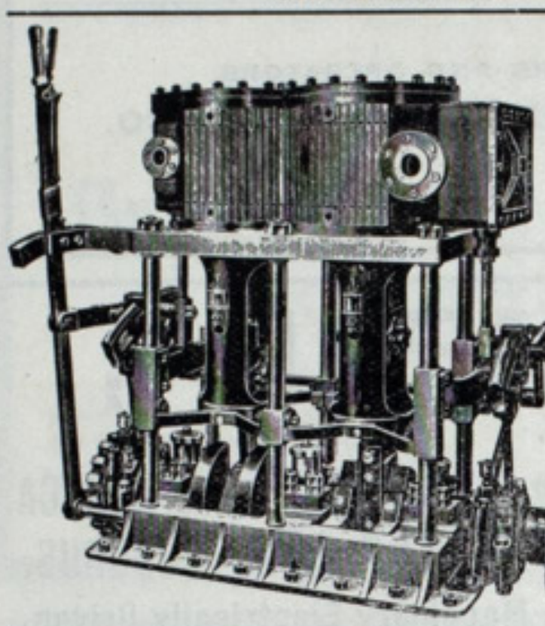

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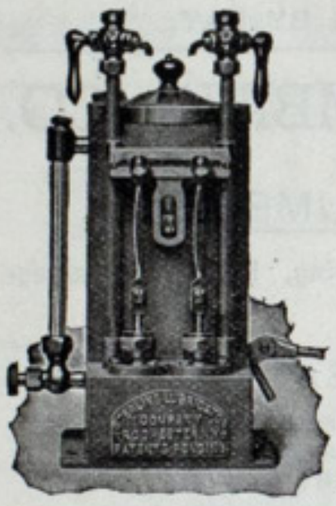

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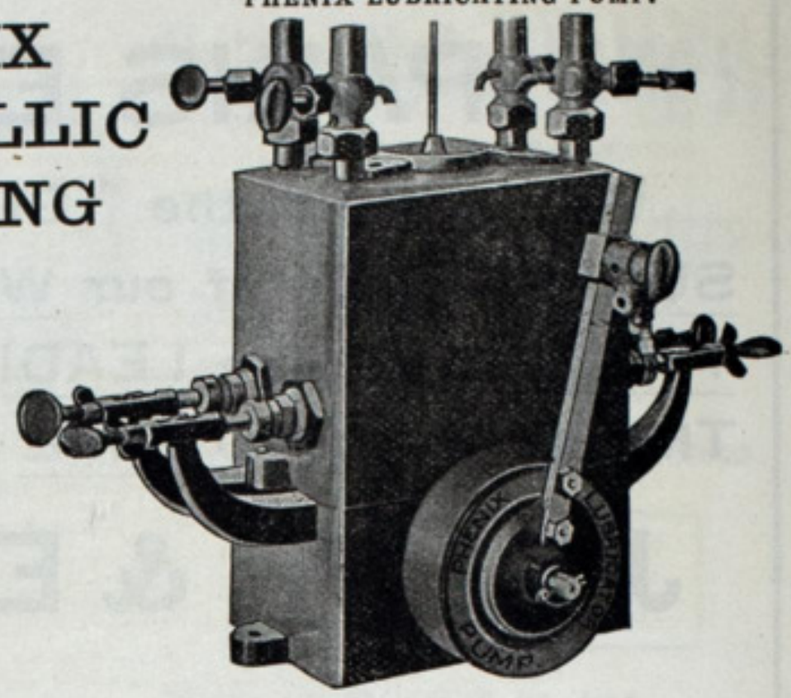

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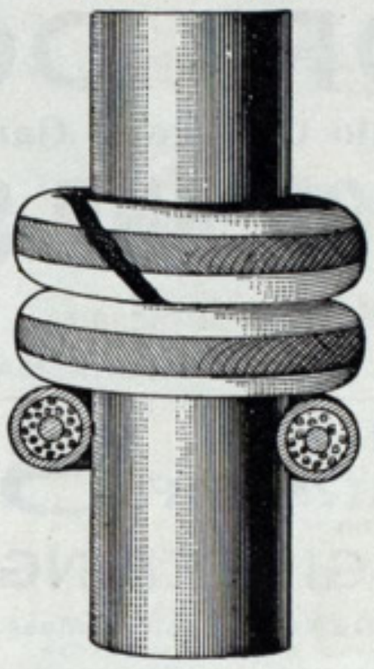

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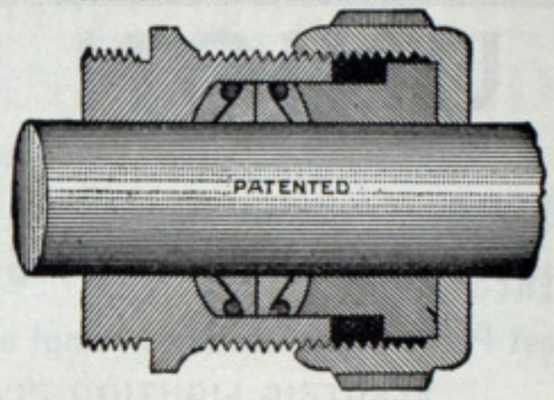

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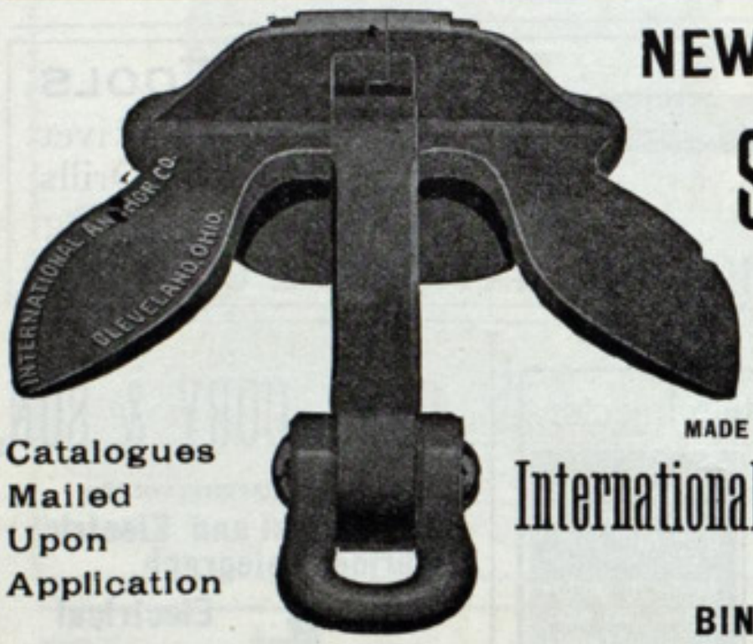

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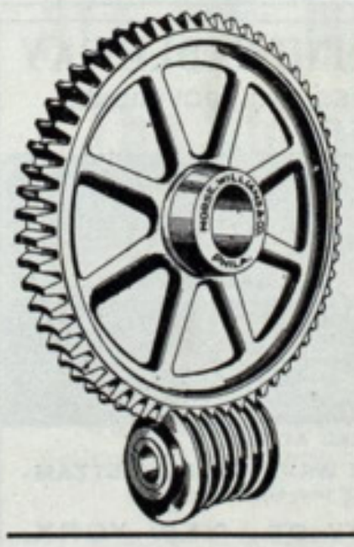

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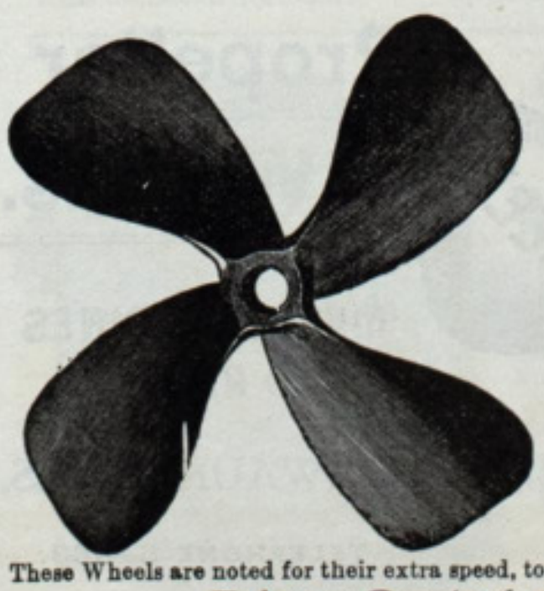

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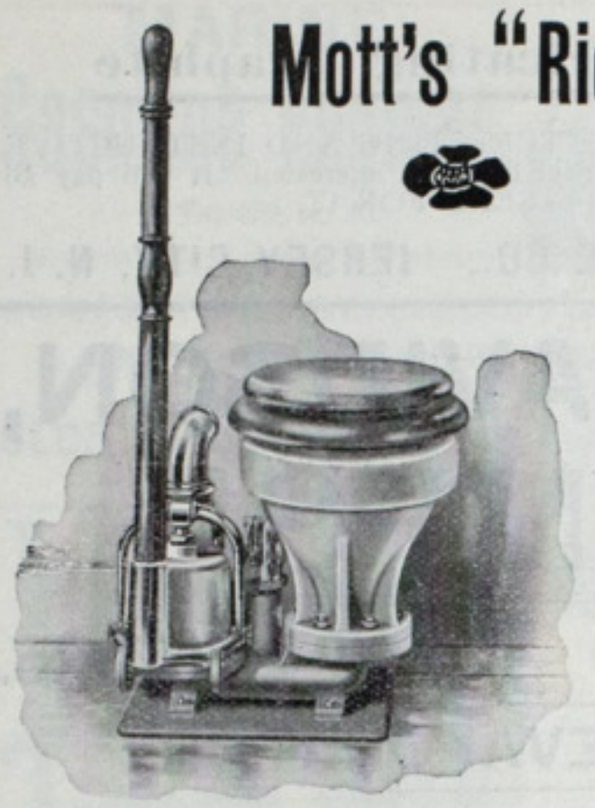

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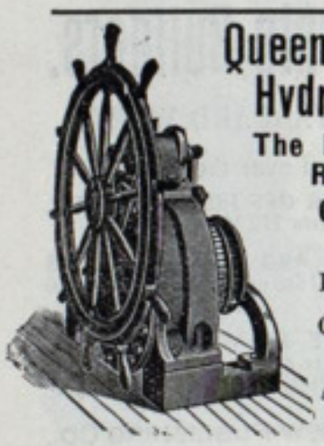

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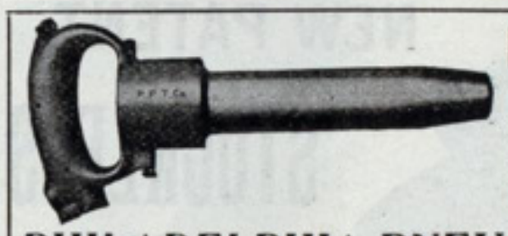

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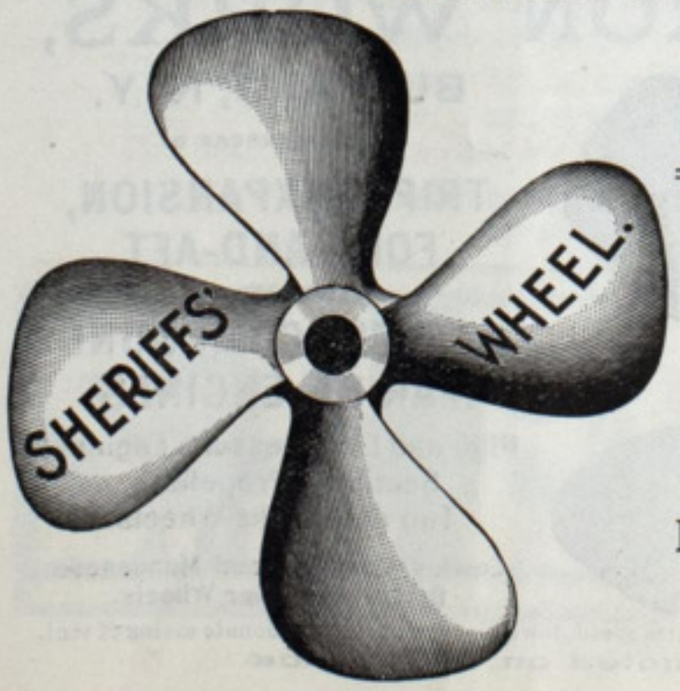

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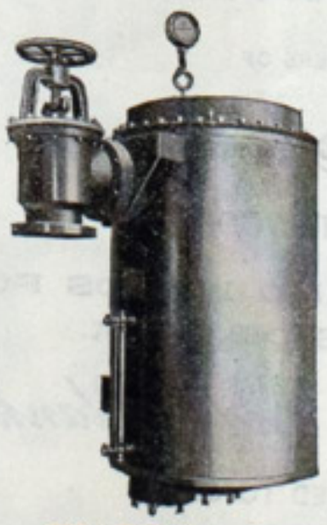

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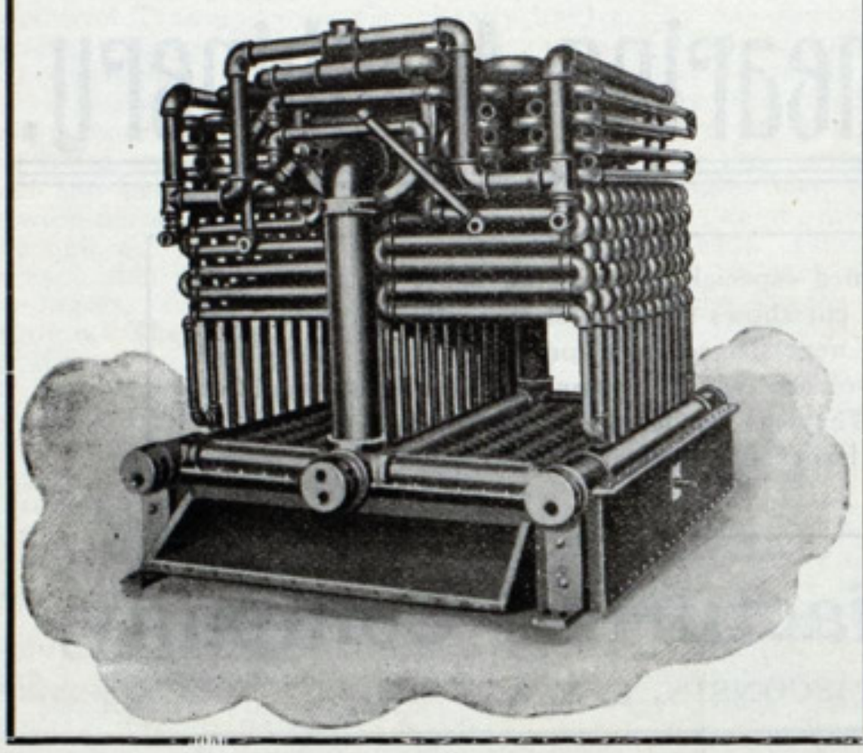

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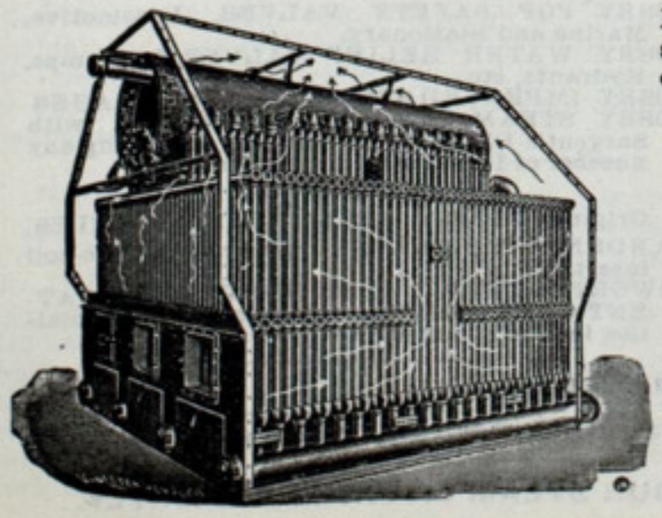

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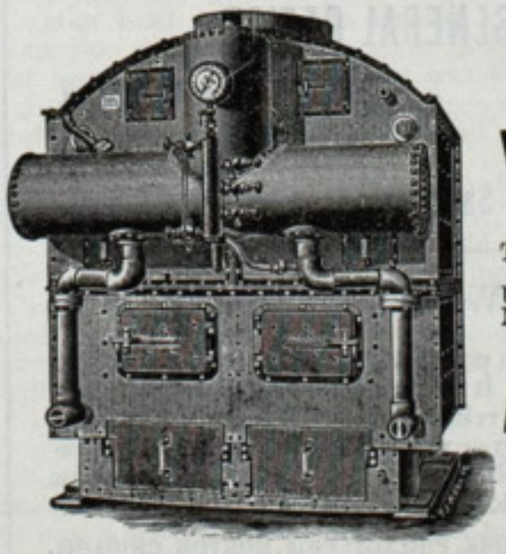

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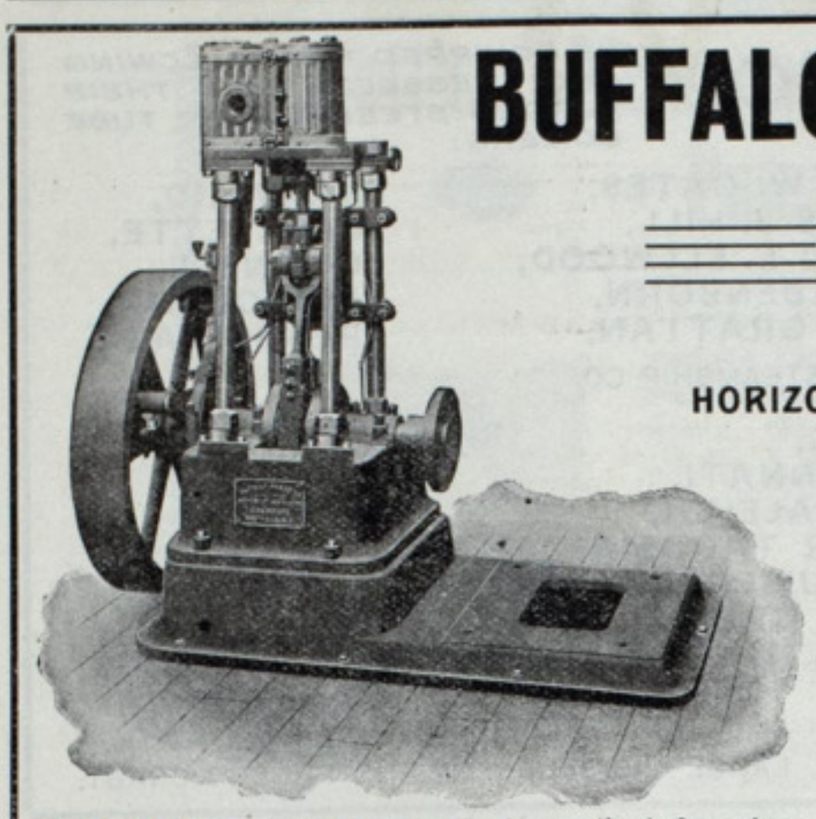
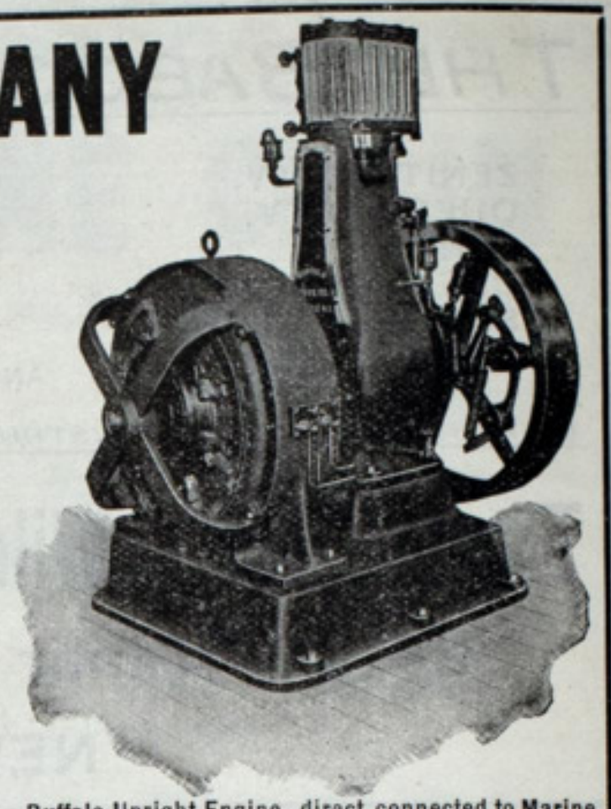


Buffalo Marine Engine, arranged for direct connection to Generator.



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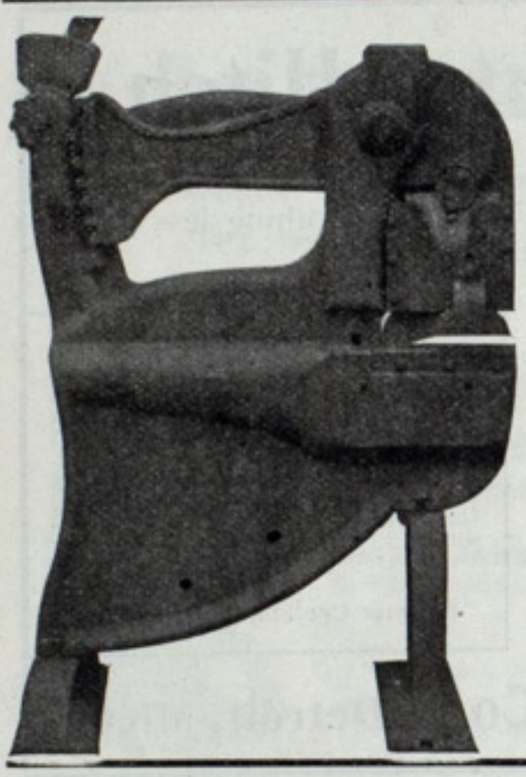

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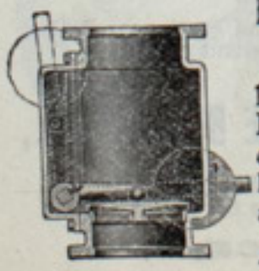

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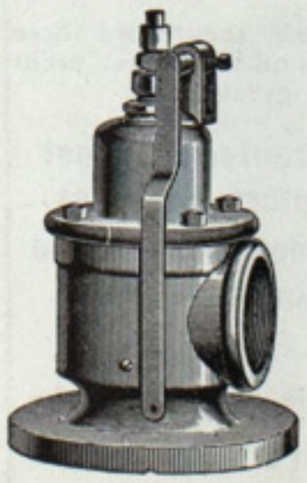

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